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'Not interrupted enough to be aware': A qualitative exploration of Paediatric Critical Care nurses' decision-making when interrupted during medication administration

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It gave a tremendous level of self-confidence, that through exploration and learning one could understand seemingly very complex things in one's environment.

(Jobs, 1995)

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I would like to thank my supervisory team for sharing their knowledge and providing excellent support.

My family have given encouragement, love and time, to allow me to complete this thesis and follow my dream.

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Abstract

Background

Globally, the prevention of medication errors is a priority, due to the risk of harm to patients and associated costs (Frontier Economics, 2014). Interruptions are frequently cited as a contributory factor in errors due to their impact on cognitive processes (Laustsen and Brahe, 2015). In Paediatric Critical Care (PCC), medication administration is challenging due to the complexity of medicines, variable weight ranges and instability of patient condition (Dickinson et al, 2012). Furthermore, interruptions have been documented to occur frequently (Bower, 2015) and nurses are noted to have a fundamental role within the medication process.

Method

A qualitative exploratory study was conducted with the aim of critically exploring and understanding PCC nurse decision making when interrupted during medication administration. Data was collected sequentially using non-participant observation (n=10) and semi-structured interviews (n=10). Observations of medication administration episodes informed interview schedules. Data was analysed using Framework Analysis (Gale et al, 2013) including a critical realism lens.

Findings

Analysis resulted in four overarching themes emerging from the data. (1) Guiding the medication process, (2) Concentration, focus and awareness, (3) Influences on interruptions and (4) Impact and recovery.

Conclusion

Decision making is influenced by interruption awareness, fluctuating levels of concentration and responding to critically ill children and their family's needs. Future development of interventions to reduce interruptions need to comprehend these influencing factors.

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Attachment – Clinical Portfolio

Please see separate volume for evidence of clinical research practice.

Chapter 1

1.1Introduction

1.1.1 Background

The safe administration of medication is a vital element in the provision of safe care and is important for children as they often associate medicines with recovery (Richardson and Glasper, 2010). Frontier Economics (2014) estimate that medication errors cost the National Health Service (NHS) in excess of £1 billion per annum. The Medicines and Healthcare Products Regulatory Agency (NHS England, 2014) quantifies that in hospitals there is an error in seven percent of prescriptions and between three and eight percent of administered medications. However, this is likely to be an understatement as it is widely accepted that not all medication errors are reported (NHS England, 2014). These figures are particularly worrying for children in critical care, as medication errors are higher in paediatric departments and intensive care units (McDowell, Ferner and Ferner, 2009), and they are three times more likely to be involved in a medication error (National Patient Safety Agency (NPSA), 2007). This increase in numbers is due to the complexity of dosing due to large variations in weight range, the adaption of adult based medication for children and age appropriate dosing (Dickinson et al, 2012).

1.1.2 Caring for Children in Hospital

Throughout their lives children have the right to be safe (United Nations, 1989). This right is paramount when the child is cared for within the NHS, as it is an environment which they can find challenging due to unfamiliarity and they may potentially require invasive procedures (Ford, Tesch and Carter, 2011). The Care Quality Commission (CQC) (2015) highlighted in their satisfaction survey of 19 000 children aged 8-15 and their carers, that eleven percent of children admitted to hospital do not perceive that they are safe whilst in hospital. The survey was undertaken during the discharge process which captured data concerning their recent admission. In an effort to improve patient safety NHS England and the Department of Health have produced targets and guidance that highlight the need for all patients to receive safe treatment whilst in the care of NHS Trusts (Department of Health (DOH), 2014, DOH, 2013 and DOH, 2007). Within these reports medication administration safety contributes significantly to the provision of a safe environment. To support this guidance, the Nursing and Midwifery Council (NMC) produced medication safety standards which provides a framework for nurses to adhere to (NMC,2007) and all NHS Trusts have a written policy to guide administration and patient safety standards which all staff are expected to follow. The CQC satisfaction survey highlights that there is significant room for improvement in ensuring that children are safe whilst in hospital, investigating the influence that interruptions to the medication process will contribute to improving medicine safety. The CQC now reviews the incidence of medication errors which cause serious harm, as they recognise that paediatric safety issues are different to those experienced by adults (Shribman, 2014). Currently there is only estimated data available which indicates error rates within paediatrics, international literature suggests an error occurs

in between 2.1% and 10.8% of hospital admissions (Cass, 2016). In future the CQC may be able to provide documented accurate evidence of reported errors which cause serious harm.

1.1.3 Caring for Children in Paediatric Critical Care

The majority of children who are inpatients within critical care require a treatment plan that includes a significant amount of medication preparation and administration. This workload is complex, involving precise, difficult calculations for medications that have a narrow range between being therapeutic and harmful (Dickinson et al, 2012). The majority of medications prescribed within Paediatric Critical Care (PCC) require two nurses to witness the preparation and administration. Medication rounds do not occur as the critical nature of the illness require medication to be administered to occur at any point of the 24-hour day. It is also recommended that medication preparation occurs in a separate room away from the inpatient area, behind a closed door (NPSA, 2007). However, the PCC nurse is required to observe their patient at all times so medication preparation occurs within the child's bed space. These environmental factors can contribute difficulties to an already complex procedure.

1.1.4 Definition of key term

Within the current literature there are a plethora of meanings for the word interruption and it can be combined with the term distraction (Sasangohar et al, 2012). Recommendations from studies and systematic reviews conclude that a clear

definition of the term must be identified when this phenomenon is examined (Biron et al, 2009). For the purpose of this study the following definition will be used which was identified by Sasangohar et al (2012) as being the only definition which includes internal as well as external interruptions.

> ‘A break in continuity of complete focus on the task of preparing medication.’
>
> Anthony et al (2010:24)

1.1.5 Interruptions in Medication Administration

Interruptions and distractions are frequently listed as key causes for medication errors (Anthony et al, 2010, Colligan and Bass, 2012, Westbrook et al, 2010 and Fore et al, 2013). Parker and Coiera (2000) discuss interruptions and note that they can generate conditions that may result in memory lapses. Problems with memory recall within a medication situation could be extremely detrimental to patient safety. Bower, Jackson and Manning (2015) designed a conceptual schema which summarise the impact of interruptions to medication administration on patient safety (see figure 1).

Figure 1 Conceptual Schema (Bower, Jackson and Manning, 2015)

Westbrook et al (2010) calculated within their observational study that there is a 12.7% increase in clinical errors when interruptions occur, for example not checking a patient's identification which is an essential step within the medication process. They were unable to determine whether these errors contributed to harmful outcomes but reducing this potential increase in clinical error could contribute significantly to a child being safely cared for whilst in hospital. However, it should be noted that some interruptions could be perceived as interventions that promote patient safety, for example responding to equipment alarms (Sasangohar et al, 2012) and these diverse interpretations should be acknowledged in the design of further studies in this area.

A previous pilot study on PCC which included 18 hours of observation (Bower, 2015) collected data which identified when interruptions occurred, noting the frequency and type. This study clarified that interruptions were frequent during the medication process, see table 1 where the data has been supported by published literature.

Table 1: Data from Pilot Study (Bower, 2015) supported by relevant published literature.

However, it did not examine nurse's perceptions regarding decision making when interrupted during medication administration on PCC. Currently, there is little evidence available in the literature concerning this topic (Dougherty, Sque and Crouch, 2011), which supports the need for further investigation of this phenomena.

1.2 Positionality

My belief as a researcher is that the real world within PCC influences nurses' behaviour and actions when interrupted during the process of medication administration. However, to explore the concept of decision making in detail I needed to explore nurses' interpretation of their thoughts and actions. Therefore, I chose to explore this phenomena using qualitative methodology, employing the methods of observation and semi-structured interviews to collect data. The recorded observations of nurses administering medication to critically ill children, informed the content of the questions used within the semi-structured interview. These methods complement this belief as it provides records of both observed actions and perceptions.

1.3 Research Question

Research questions are described as a vital part of a research study, unless methodologies such as grounded theory are employed. Questions will apply a focus within the wider topic area and help the researcher to choose an appropriate method to deliver an answer (Sim and Wright, 2000:17). Using a PEO (Population and their problem, Exposure, Outcome or theme) structure allowed the question to identify the population, what was investigated and the outcome (see table 2). This created a focus and provided a question that is able to be answered (Aslam and Emmanuel, 2010).

Table 2 PEO Structure

Population	Paediatric Critical Care Nurse, Paediatric Intensive Care Nurse
Exposure	Interruption during medication administration
Outcome	Decision making

The research question is stated below and supported by the following aim and objectives.

What decision making process is used by PCC nurses when interruptions occur during medication administration within the critical care environment?

1.4 Research Aim

To critically explore and understand PCC nurse decision making when interruptions occur during medication administration in the critical care environment.

1.5 Research Objectives

- To explore medication administration in practice, recording context, interruptions and actions observed.
- Using a semi-structured interview, critically analyse ‘real life situations’, to gain greater insight into the decisions made with reference to influencing factors and perceptions of efficacy.

1.6 Summary

Medication safety is a vital contribution in providing an environment in which children and young people are cared for safely. Within the current literature it has been highlighted that there is a paucity of work which explores the decisions made by PCC nurses in the clinical environment when interrupted whilst administering medication. The method of combining real world situations and interviews with critical realism in depth analysis should offer novel insights into an unexplored world.

The thesis will offer a thematic review of current literature and a detailed description of methodology, method and analysis. It will then present the findings of the study using Framework Analysis matrices and additional narration. The discussion will focus on the key findings which provide answers to the research questions listed in section 1.3. With the benefit of new knowledge and hindsight the limitations of this study will also be commented upon.

Chapter 2

Literature Review

2.1 Introduction

The purpose of this literature review was to critically appraise the literature within the field of medication administration and interruptions. Green and Thorogood (2014:259) note that the review should help to identify current debate which in turn helps build an argument which supports the need for further research. The review will initially summarise the strategy used to support the evidence search, before thematically appraising the literature.

2.2 Search Strategy

The articles selected for this review were empirical studies and systematic reviews published in peer-reviewed journals. The databases used within the literature search were Medline, Cumulative Index of Nursing and Allied Health Literature (CINHAL), PSYCHinfo, British Nursing Index (BNI) and EMBASE. These databases were selected for their links to specific journals, overall they produced a wide ranging search, including multiple specialities. BNI and CINHAL were selected because they both search nursing journals. However, the BNI contains journals printed in English, mainly British (Cronin, Ryan and Coughlin, 2008), so CINHAL was also included, for

access to international journals. Wright, Golder and Lewis-Light (2015) also note that it is a good source of locating qualitative empirical studies. Medline was included to allow access to medicine and life science journals and PsycINFO for its access to psychology journals (Cronin, Ryan and Coughlin, 2008). EMBASE was also searched because it includes pharmacology articles and it was thought that it was important to search journals where pharmacists are liable to publish.

The search strategy for this literature review was restricted to primary research published from 2010. Cronin, Ryan and Coughlin (2008) suggest an appropriate time frame for literature searching is 5-10 years unless there is seminal evidence which should be included from older literature. A previously published review of relevant literature (Bower, Jackson and Manning, 2015) demonstrates the researchers' familiarity with the evidence base, did not highlight older seminal work that should be included. This timeframe was selected to ensure that the literature represented contemporary healthcare practice, which is particularly important in the PCC setting as there are continuous advances in technology, medicine and care that affect organisation and delivery (Sole, Klein and Mosely, 2013:10). Both keyword and subject heading searches were completed, to improve the search strategy (De Brun and Pearce-Smith, 2014:50). The key words included in the search were medication administration OR drug administration OR medication preparation AND paediatric nurses OR pediatric nurses OR children's nurses AND interruptions OR distractions and clinical decision making. Examples of search results can be seen in more detail in appendix 1. The flow chart in figure 2 describes the search process and table 3 summarises the inclusion/exclusion criteria.

Figure 2 Search results flow chart

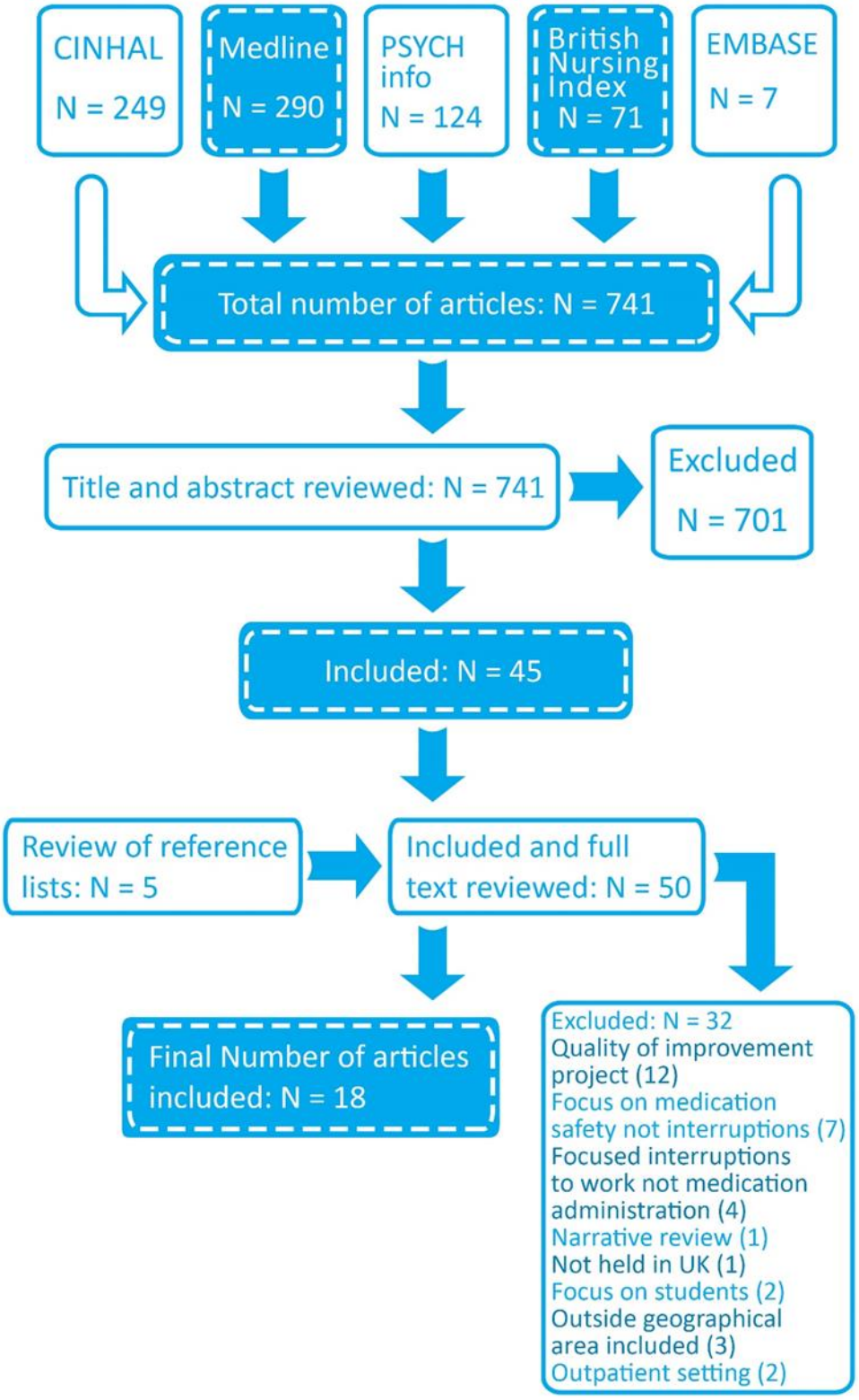


Table 3 Inclusion/Exclusion Criteria

Included	**Rationale**
2010 - present	Usual maximum timeframe of 5 -10 years is usually the reference mark unless there is seminal work that is older (Cronin, Ryan and Coughlan, 2008). The shorter timeframe of 5 years was selected to ensure contemporary studies were selected as these would have similar staffing levels, access to technology and policies as today.
All primary empirical research concerning medication administration, interruptions and clinical decision making with inpatients	Original work that will allow critical appraisal of research methodology.
All systematic secondary reviews	May provide analysis and synthesis of multiple studies, providing evidence to support or dismiss an argument.
Excluded	**Rationale**
Literature from before 2010	To ensure studies included in review are relevant to current healthcare practice.
Anecdotal or opinion sources	These will be excluded as they are unlikely to have a documented evidence base.
Quality improvement articles	Not always subjected to strict methodological and ethical review.
Empirical research concerning medication administration, interruptions and clinical decision making that involve undergraduate student nurses	This study is focused on registered nurses.
Literature from outside Europe, America and Australia	Differences in healthcare settings

Once the database search was completed and the articles selected for review and appraisal, the reference lists were hand checked for further articles which may not have been highlighted in the search (Horsley, Dingwall and Sampson, 2011). A table

summarising the articles selected for review and appraisal can be found in appendix 2. The Critical Appraisal Skills Programme (CASP) has designed checklists to enable robust reviews of literature (CASP, 2013). These tools were used by the researcher to appraise the current evidence base to ensure a critical review of previous studies occurred (Cronin, Ryan and Coughlin, 2008 and Green and Thorogood, 2014:261). The themes within the literature were synthesised and presented within the following literature review, highlighting the debates within each theme.

2.3 Background

The prevention of medication errors is high on the patient safety agenda within the global nursing community, literature within the review has been accessed from Europe, North America and Australia, due to the similarities in health care provision. The statistics for medication errors within the United Kingdom and internationally have already been noted in Chapter 1. The fiscal costs of these errors across the world, as well as ensuring that patients are cared for in a safe environment, demand that empirical studies should be able to demonstrate improved patient outcomes. These are particularly important within paediatrics as medication administration is especially challenging due to the use of adult formulations, off-label prescribing, lack of standardised formulations, use of multiple formulations, interchanging dosage units from milligrams to micrograms to nanograms (Sears et al, 2013). These challenges highlight that children require different administration processes to those required by adults, yet there is a paucity of evidence within this area (Sears et al, 2013). This review will synthesise the evidence which is currently available concerning the impact

of interruptions, their relationship to errors, prevention of interruption strategies and the decision making process that is involved when handling an interruption. Wherever possible literature concerning children will be used, however, this evidence base is small and it will be necessary to use evidence from other nursing specialities such as adult intensive care and adult wards.

2.4 The Medication Process

The singular process of administering a medication is complex (Sears et al, 2013 and Jennings, Sandelowski and Mark, 2011) as it contains elements of calculation, patient assessment, pharmacology and policy knowledge. Li et al (2012) identified that clinical tasks within health care have been categorised into three abstract groups; procedural, problem-solving and decision making. Within the process of medication administration there are elements of all three groups, which demonstrates the complexity of the activity. For example, the task itself is a procedure and the nurse must adhere to hospital policy, calculations that require solving would be present and the nurse may need to make a decision clarifying whether patient status allows administration of the medication. Medication administration to children is challenging; within the paediatric critical care environment it is complex, time consuming and often crucial to for the survival of the child (Sears et al, 2013 and Anthony et al, 2010). The nature of PCC enhances these complexities as the calculations are individual to the child and haemodynamic instability can result in challenging decision making.

Enclosing medication administration in a private room to create an isolated activity where the nurse can focus on a single task with no influence from patients, families, the environment or other members of the healthcare team would reduce a large amount of interruptions. However, this does not occur in PCC due to the continual observation required by patients, therefore medication activity becomes an integral part of nursing care. This demonstrates why medication administration cannot be examined in isolation which is how it is examined when the method of simulation is used (Colligan et al, 2012, Fore et al, 2013 and Colligan and Bass, 2012). In contrast, other studies have highlighted the integration of medication administration into the daily routine of caring for a patient. Jennings, Sandelowski and Mark (2011) in their ethnographic study found that medication administration structures the nurses' day, and that because it is inseparable from other areas of nursing care it inherently attracts interruptions. Westbrook et al (2010) support this notion by identifying that that medication administration is not a linear process and nurses often move between tasks. With this knowledge in mind it is important for empirical studies not to isolate medication administration but to include the wider context of nursing care.

2.5 Paediatric Medication Errors

The specific error rate within paediatrics is extremely variable, and is unlikely to be accurate as medication errors are known to be underreported (Alomari et al, 2015). However, children are vulnerable and it is stated within the literature they are three times more likely than adults to be involved in a medication error (Murphy and While,

2012) and the errors are more likely to be harmful (Colligan et al, 2012). Sears et al (2013) conducted a descriptive, prospective study examining the relationship between paediatric medication errors and the work environment. They found that the mean number of errors reported in critical care over three months was 15.83 (six critical care units reported 95 errors within a 3-month period), with a primary factor or cause being distractions. The tool used within this study was tested for face, content and construct validity, this rigorous critiquing would help to ensure it was testing what it set out to test (Bowling, 2009). The tool included questioning about levels of quality of care so despite the comprehensive testing of validity it could be argued that these questions would be subjective and open to interpretation between nurses.

Alomari et al (2015) conducted a systematic review of the literature examining families, nurses and organisational factors which contribute to medication administration error in paediatrics. However, this review was limited to four databases, which did not include one that would search the psychological literature, which may have offered different empirical resources. They concluded that the factors which contribute are communication failures between families and health care professionals, nurse workload, failure to follow policy, interruptions, inexperience and insufficient education. They note that even though strategies such as double checking, barcoding and computerised systems have been implemented, errors remain common. Within their discussion they note the lack of research which has involved families in this area.

The medication error rate previously mentioned by Sears et al (2013) indicates that children are at risk of harm whilst in critical care environments. Complex calculations

and administration contribute to increase the complexity of the process which is then compounded by an environment where interruptions are frequent. New, innovative empirical studies need to be designed which can provide an evidence base for interventions which will promote a medication process that will ensure children and their families are cared for safely during their hospital stay.

2.6 The Role of the Nurse

There is a multidisciplinary team involved in the prescribing of medication; medical staff, pharmacists and nurses. However, nursing staff are fundamental within this process (Anthony et al, 2010) as they have a responsibility in all stages of the process Sears et al, 2013). Nurses are expected to check the prescription for errors, ensure it is appropriate that the child receives the medication, prepare and administer the dose. The fundamental role of the nurse within medication administration reinforces the need to use analysis methods that embrace the input from individual nurses. Once the process reaches the stage where the nursing team are preparing and administering a medication, there is usually no routine input by other members of the multidisciplinary team, the safeguards available are adherence to policy (Dougherty, Sque and Crouch, 2011 and Murphy and While, 2012) and the independent double checking procedure.

The ‘double checking’ procedure is common within paediatric medication administration, certainly for intravenous and complex medications (Murphy and While, 2012), the process involves two nurses independently checking the prescription and administration of medication. Murphy and While (2012) found that 85% of the

paediatric nurses they surveyed always double checked unusual doses with another nurse, this survey is limited by a small sample size from a single unit. However, it would be interesting to investigate the role of double checking medications in contributing to interruptions during medication preparation. When nurses enter an automated phase of the task the presence of another nurse may encourage non-medication related discussions. This phenomenon has yet to be explored within the literature.

2.7 Interruptions to Medication Administration

There is a large body of literature which examines the phenomena of interruptions to nurses' work, medication administration is often identified as a process which is frequently interrupted (Anthony et al, 2010, Colligan et al, 2012, Sasangohar et al, 2015). A systematic review of medication errors (Keers et al, 2013) found that 30% of the studies included listed interruptions and distractions as a cause of mistakes. However, Keers et al (2013) highlight that much of this data is descriptive. Within this review, qualitative and quantitative studies were included, making it difficult to compare results.

Sasangohar et al (2015) discovered in their observational study that intensive care nurses are interrupted frequently, especially during high-severity tasks, which includes medication administration. Within this study it was identified that during the observation period one interruption occurred every five minutes and nurses were the most common source. It is often assumed within observational studies that there is

potential for a Hawthorne effect, which in this case could result in a reduction of interruptions seen, especially as the participants were aware that data was being collected about events that led to an interruption. This was a well-designed observational study, with trained observers and an electronic data collection tool. Interrater reliability was assessed using the kappa score, which demonstrated high levels of agreement. There were limitations to the study, one limitation of which was the use of a single unit which restricts the generalisability. Another limitation of the study is the definition used within the study, 'an external intrusion of a secondary task, which leads to a discontinuity in primary task' (Sasangohar et al, 2015). This may affect the data collected as it has been highlighted in the literature that there are several different types of handling strategies, some of which do not result in a discontinuity of the primary task. This definition does not include internal interruptions, for example initiating a conversation which would also contribute to the data collected (Anthony et al, 2010).

Jennings, Sandelowski and Mark (2011) performed an ethnographic study which evaluated a nurse's medication workload. The researchers within this study immersed themselves within the culture of a ward to gain insight into the impact of medication delivery had within a nurse's workload. They disagree that medication errors can be reduced by decreasing interruptions as they found that medication administration is inseparable from nursing care. Interruptions were unable to be counted as there was no beginning or end to a medication administration process. This study pulled data together from observation, interviews and documents which demonstrates an in-depth ethnographic study (Bowling, 2009). This study strongly supports the need for studies

to observe medication administration within the overall process of nursing care and not as a separate entity.

2.8 The Effects of Interruptions

Frequently interruptions are viewed as having a negative association with medication administration. Westbrook et al (2010) who state that each interruption was associated with a 12.1% increase in procedural failures and a 12.7% increase in clinical errors. Closer examination of the results indicated that there was a decrease in clinical errors when staff were interrupted 1-2 times, the number of errors increased when interruptions occurred 3 or more times. This highlights a significant limitation to this study as the reasons for the interruptions were not discussed, it is not known whether being interrupted 1-2 times is beneficial in reducing errors or whether on those occasions the interruption helped to prevent an error. This study highlights the complexities of analysing the relationship between interruptions and errors, however, it does demonstrate that frequent interruptions increase activities that can lead to errors, such as failing to check the patient's identification.

In contrast, Sasangohar et al (2015) demonstrated that within critical care the not all interruptions are detrimental to nursing care, they may communicate information about a task or patient which is important. They also observed that interruptions which included personal content occurred more frequently during low severity tasks, suggesting that on occasions interruptions are filtered when critical tasks are being carried out. This supports the need for interventions to filter interruptions, rather than

reduce frequency. This also demonstrates the need for exploratory work which analyses the decisions made by nurses when interrupted. It is important to understand how nurses choose to respond to interruptions.

2.9 Interventions to Reduce Interruptions

There is a large body of evidence concerning the reduction of interruptions during medication administration. Often multiple interventions are instigated at the same time making it difficult to discern which intervention is effective (Relihan et al, 2010). There are a lack of randomised controlled trials (RCT's) in this area, as pre and post intervention trials seem to be the method of choice, despite RCT's being viewed as the gold standard of trial design (Blackwood, O'Halloran and Porter, 2010).

In their systematic review Raban and Westbrook (2013) question whether interventions to reduce interruptions and errors are effective. They conclude that currently there is very weak evidence to support their use. Their search of the evidence base led them to decide that there were too few studies and those that were available were of poor design. Before interventions are widely adopted controlled trials need to be run to demonstrate their value. Within the review the databases identified allowed for a robust search of the evidence and the strategy employed was well documented. The review process was completed by two researchers but there is no documentation of any appraisal tool.

There are different types of interventions that have been implemented within healthcare; sterile cockpit areas, coloured tabards, checklists, lanyards and education programmes. Two of the more common interventions; sterile cockpits and coloured tabards will be discussed in further detail.

2.9.1 Sterile cockpit

The sterile cockpit / No interruption Zone (NIZ) is a framework adopted from the aviation industry which likens the medication process to that of take-off and landing an aeroplane where no communication or interruptions occur unless there is a safety concern (Anthony et al, 2010). The design of the sterile cockpit studies aims to reduce all interruptions and communication non-essential to medication administration (Anthony et al, 2010, Colligan et al, 2012, Fore et al, 2013).

Sterile cockpits / NIZ have demonstrated significant decreases in interruptions, Anthony et al (2010) identified a 40% decrease in interruptions within three weeks of implementation. Colligan et al (2012) noted a mean interruption rate reduction of 1.4 to 2.7 post intervention. Fore et al, (2013) describe a reduction from a mean 4.1 to 1.5 eleven weeks after implementation. These statistics appear to address the issue of reducing interruptions to the medication process. However, this framework did raise issues in some units, Anthony et al (2010) who conducted their study in an adult intensive care environment found that there was medication related conversations that were vital to the safe administration of medicines, for example between a junior member of staff and their supervisor when clarity was required about a medication.

They were unsure how these conversations could continue without distracting another nurse. Within the paediatric critical care environment where medication administration occurs at the bedside it is vital that nurses are able to respond to changes in patient condition as these can be life threatening. Furthermore, Colligan et al (2012) note that using an enclosed private room for medication administration which would be a true sterile cockpit area could have negative consequences due to the perceived lack of availability of nurses.

Colligan et al (2012) used a modified sterile cockpit medication area within their study. They created focused barriers around the medication area in response to simulation, interview and observational data. The barriers were made of frosted glass so allowed children and parents to note that there was a nurse present but encouraged nurses to block interruptions when completing the final step of the checking process. The mean interruption rate was reduced from 1.4 – 0.27 per occurrence post intervention. This attempts to address issues such as communication and visibility, whilst allowing the final check in the process to be interrupted less frequently.

2.9.2 Tabards

Verweij et al (2014) note that the use of do not disturb tabards during medication administration is common, however, there is limited evidence supporting their use. They performed a mixed method study to evaluate the impact of tabards on the frequency and type of interruption and error rates. The study combined observation with personal enquiry and focus groups. The definition of interruption in this study

allowed for the inclusion of distractions which allows richer data to be collected. Participants were unaware of the nature of data being collected by the six observers, which questions whether the observed nurses were able to give truly informed consent. Interrater reliability was assessed by interclass correlation coefficient, which highlighted two areas with poor scores. The observers were student nurses who did not appear to receive observational training, which may have improved these scores.

Within the study performed by Verweij et al (2014) the implementation of tabards reduced interruptions by 75%, from 517 interruptions during 313 medication episodes to 112, which was statistically significant with a P value of less than .05. However, the analysis shows that this reduction was only observed when interruptions were caused by members of staff. When the interruptions were due to patient need analysis was not statistically significant with a P value of .09. This may support the argument that the implementation of an intervention raised awareness of interruptions to staff which altered behaviour rather that the tabard itself reducing them. The qualitative data from the personal enquiry and focus groups highlighted mixed feelings within the nursing team. Some felt it attracted questions and attention from patients and visitors and others that it created a barrier when they should be available to patients at all times.

2.9.3 Intervention bundle

In contrast, Relihan et al (2010) implemented a bundle of interventions; behaviour modification, education, checklists, red aprons, patient information leaflets and signs. The effectiveness was assessed by pre and post interventional observation, counting

both interruptions and distractions per hour (justified due to differing lengths of medication episodes), as opposed to Verwij et al (2014) who calculated rates per episode. Differences in the method of measuring interruption rates makes comparison between studies difficult as they are not comparable.

The education sessions were introduced first closely followed by all other interventions. The average interruption rate per hour decreased from 26 to 11.4 which was statistically significant with a P value of less than 0.001. Within this study it is impossible to distinguish whether all interventions within the bundle are required to reduce interruptions or just one. There had also been an introduction of a new medication policy between pre and post intervention observation which may have altered the behaviours seen.

The interventions discussed in this review have all been assessed by pre and post interventional studies, all of which are subject to the Hawthorne effect. Although some studies demonstrate that there have been significant reductions in interruptions, this change can never be completely attributed to the intervention as there has been no control group to demonstrate this. The interventions outlined in this section are designed to remove all interruptions regardless of their effect on patient safety. Responding to a deteriorating patient in PCC is vital and interventions need to reflect this. Gaining insight into how nurses choose to react and manage interruptions will be influential in the design of such an intervention.

2.10 Clinical Decision Making in Medication Administration

Several different interruption handling strategies have been identified within the literature (Colligan and Bass, 2012). These strategies included prioritisation, multitasking, delegation and blocking. Each strategy results in different actions and can produce a different outcome to the primary task. There is very little literature which discusses how nurses make decisions during medication administration and how they chose to handle an interruption.

Dougherty, Sque and Crouch (2011) examined risk taking and decision making during intravenous medication preparation. They performed an ethnographic study which included focus groups, observation and interviews. The findings demonstrated that interruptions and decision making are a major theme within medication administration. This study allowed the observation to inform the interviews ensuring that 'real life' situations and actions were discussed. However, each interview only last between 15 and 30 minutes which may not be long enough to develop close rapport which Fontana and Frey (1994:367) note provides more informed research.

Colligan and Bass (2012) used simulation, interviews and observation to examine interruption handling strategies during paediatric medication administration. Their study highlighted that nurses select a strategy after receiving an alert. Four strategies were identified which are similar to those already mentioned; engaging (primary task suspended to deal with high priority secondary task), multi-tasking (both tasks are completed), mediation (delegation to another member of staff) and finally blocking

(interruption is blocked concentration remains on primary task). Colligan and Bass (2012) found that these decisions were influenced by risk and workflow assessments and experience. An element of this study was based on simulation which is limited as not all actions are exactly the same when transferred into clinical practice (Robson, 2011:362).

Sitterding et al (2014) used a cross-sectional, qualitative descriptive design to identify situational awareness, interruptions and their handling strategies. Two groups of nurses (junior and experienced) were included, medication administration was videoed and within one week the nurses were interviewed using the video data. The interviews used the critical decision method framework for structure. They found that the most common handling strategy used was engagement, where the primary task is suspended for the priority secondary task. This decision is influenced by factors such as urgency, importance, time and cost. Sitterding et al (2014) also note the difficulties faced by nurses when involved in medication administration; constant auditory and visual processing, the impact of stress on memory and stacking of jobs. The use of video observation in this study removes the issue of observer bias, however, there is still a possibility of the Hawthorne effect being present

2.11 Summary

The environment of PCC is unique; critically ill patients combined with extremely variable weight ranges. This ensures that administration of medication is a complex activity which is a vital component in the treatment plan for all children. The nurse

holds a fundamental role in this process, therefore, it is essential that the structure of and analysis within empirical studies enhances their viewpoint. Current interventions aim to reduce all interruptions, which can compromise patient safety. It is vital that studies gain great insight into the decisions nurses make when delivering care, administration of medication and responding to interruptions so ta future interventions embrace strategies that are effective in the real world of contemporary nursing practice.

Chapter 3

Methodology

3.1 Introduction

Green and Thorogood (2014:5) describe qualitative methods; as seeking to understand the why, how or what of a phenomenon. This aligns with the research questions identified in Chapter 1 which are searching for the what and how of decision making when interrupted during medication administration. This chapter will provide background information regarding the philosophical beliefs which underpin the study and identify the research methods chosen. Additional information and debate will be provided to support and strengthen the justification for the methods chosen within the study.

3.2 Ontology

A key principle in this study was that the data collected should reflect the reality that PCC nurses experience. It was also highlighted in the literature review in Chapter 2 that medication administration is an integral part of nursing care, therefore it should be examined in reality rather than as an isolated task in a laboratory. There are opposing views within ontology, referring to the understanding of reality. It maybe context free and ready to be discovered (objectivism) or there maybe multiple mental constructions

of reality bound by context (constructivism) (Killam, 2013:7). Within qualitative research reality is constructed by individuals involved in the research area, therefore, multiple realities exist, those of the researcher, the participants and the reader (Creswell, 1998:76).

3.3 Epistemology

Epistemology examines the nature of human knowledge, identifying how knowledge is gained and whether it is justified (Audi, 1998: xi), which influences the objectivity or subjectivity of the design (Killam, 2013:6). Knowledge based on individual perception and the understanding of complex relationships forms the belief framework of interpretivism (Flick, von Kardoff and Steinke, 2004:8). Inductive methods are used by interpretivists where data is collected and theory generated from it and they allow their values and perceptions to influence the interpretation of the data (Mustafa, 2011). Within the literature review presented in Chapter 2 it was highlighted that greater understanding of decision making was required, therefore an interpretivist approach was selected to allow the perceptions and complexities of this process to be explored.

3.4 Methodology

Methodology relates to the conceptual framework that supports the underpinning approach; it is a strategy which links methods to outcomes (Creswell, 2003:5). Simplistically, they can be split into three categories: quantitative, qualitative and

mixed methodology with more succinct strands within those categories (Creswell,2003:4). These frameworks orientate the strategic design of the research; ensuring background literature, questions, design and analysis are viewed through the same lens. The framework selected for this study is critical realism.

3.5 Critical Realism

Critical realism was the theoretical paradigm used within this study, it is a post positivist theory which is situated between positivism and constructivism (Walsh and Evans, 2014 and Clarke, 2008:167). The origins of this theory are grounded in Roy Bhasker's work and it is noted to be ontologically strong and epistemologically shy (Pratt, 2009). Critical Realism has an ontological base in realism but can be linked epistemologically to both constructivism and interpretivism (Maxwell, 2012:5) As previously noted this study adopts a realistic ontological view with an interpretivist epistemology.

Clarke (2008:167) notes that critical realism acknowledges that there is knowledge that is independent from humans but scientific enquiry has limitations due to the complexity of reality and the influence agency and structural factors have on human behaviour. Critical realists argue that an objective reality exists, which is formed from events and underlying causes but these cannot be reduced to one set of observable or constructed events (Clarke, 2008:167 and Reed, 2009:433). Three levels of reality are defined within critical realism: the actual, the real and the empirical (Clarke,2008:167 and Reed, 2009:433). The actual domain is described as the events and outcomes that happen within the world. The real domain acknowledges the

structures, tendencies and relations which can influence and change the actual reality. The empirical domain relates to the human perspectives within reality (Clarke, 2008:167). Critical Realism attempts to focus on understanding reality as it exists and seeking to understand and provide explanations for these events and outcomes (Clarke, 2008: 167). When this study was conceptualised, it was important that the data collected events from the actual reality which would allow the interview to identify the human perspectives within the empirical world. The analysis would then try to identify the structures, tendencies or relations that can influence and change the actual reality.

3.6 Research design

An exploratory qualitative study was designed using non-participant observation and semi-structured interviews (for detailed research protocol see appendix 3). The research questions within this study dictated the chosen method as it was necessary to explain and understand human behaviour (Streubert and Carpenter, 2011:3). Denzin and Lincoln (1994:2) highlight that qualitative researchers study the phenomena under examination in their natural setting, with an aim to understand or interpret meaning. This was a key concept as observable actions and events were recorded within the field notes during the observation sessions which were then used to inform the semi-structured interviews. The data was analysed by using Framework Analysis in which a critical realism lens was applied to interpret the data.

3.6.1 Sample

The study was conducted in the PCC unit where the researcher had previously worked. Morse (1994:222) note that feasibility is an important factor in research design and using this unit allowed the researcher access within the required timeframe. Presenting the study to the Ward Manager and Lead Intensivist also helped to gain access within the required time.

A convenience sample of PCC nurses was used within the design. The sample should be information rich and meet the needs of the study (Morse, 1994:228), in this case it was essential that the sample included only nurses involved in medication administration in a PCC environment. All nurses, within the unit were invited to participate via hospital email. Posters were placed in staff rest rooms to inform the team that this email had been sent, to ensure all nurses were aware that they had been invited to participate, this created a potential sample size of 70.

A sample size is often guided by the quest to achieve data saturation and estimating this is difficult (Morse, 2000). The size was guided by Morse (2000) who lists factors which can be used to inform the design of the sample: scope, nature, quality, design and use of shadow data. Table 4 below offers a summary of these factors with reference to this study.

Table 4 Factors which influence sample size

Factors	
Scope	The broader the scope of the project the more participants will be required. The scope of this study was focused on understanding the decisions taken by PCC nurses when interrupted during medication administration.
Nature	If the topic is obvious and clear it is easily attainable and fewer participants are required. In this study the participants are being asked about their actions in relation to a specific situation they had recently experienced. This may be affected by inability to recall information, raising potential distressing issues or pressure from the work environment.
Quality	This relates to the ability of the participant to talk about the topic. Including the 'real life' situations will help the participant to talk about the topic, however, they may be affected by experience, distressing or difficult issues or the willingness to share.
Design	The design of the study allows data to be created by both the interview and the field notes taken during the observation period.
Use of shadow data	The concept of shadow data relates to participants talking about the experience of others. Within this study this avenue of questioning will not be pursued as it relates to that participant at that particular time.

This guidance from Morse (2000) does not arrive at a specific number the researcher can aim for but highlights the factors that should be considered. Baker and Edwards (2012) who asked several renowned qualitative researchers 'how many qualitative interviews is enough?' offered guidance for Master's theses at 12 - 20 interviews. However, this document also highlighted practical considerations such as resources available and time frames. After careful consideration of the factors listed by Morse (2000) and examination of the time available to complete the study the decision was taken to aim for a sample of 8-10, the final sample reached was 10 (n10). The sample of 10 nurses (see table 5 for sample demographics) then dictated when the observation and interview would occur as it was dependent on their rota.

Table 5 Sample Demographics

Sample demographics	
Sample size	10
Gender Female Male	 10 0
Grade Band 7 Band 6 Band 5	 4 3 3

3.6.2 Data Collection

Non-Participant Observation

Bowling (2009:386) highlights that the observation of events and their outcomes, noting behaviours, actions and interactions is a tool which adds to the understanding of complex situations. Non-participant observation was chosen as it was impossible for the researcher to participate in medication administration and observe other people's actions and behaviours. It would have been unsafe for the child as full concentration would not have been applied to the administration of medication which would have compromised adherence to Standards for Medicines Management (NMC,2007).

The tool used to record the observation (see appendix 4) was designed and piloted in a previous study (Bower, 2015). The tool was semi-structured with a checklist of

common interruptions and space for comprehensive field notes, noting settings and timings. Green and Thorogood (2014:169) highlight that the observer should have a system for recording their observations, which should include descriptions, tasks, behaviours and conversations. The use of a checklist within the tool for allowed the researcher to spend a little more time observing. However, the free text allowed for more detail to be entered.

Researcher impact is a limitation of non-participant observation; participants may alter their behaviour due to the presence of the observer. It is thought that this may reduce over time bit it is likely that there will always be some impact and the researcher needs to be aware of this throughout each stage of the study (Bowling, 2009:391)

Observer bias is also another area which can be a limitation within observational studies. The presence of the researcher was not unusual in the observed environment as she had previously been a ward sister. However, her presence recording observations may have impact on the behaviour observed. The researcher should be trained to document actual events that are occurring and not their perceptions (Bowling, 2009:390). Prior to this research study the researcher had received some training in what and in documenting observations from an ethnographer. Inter observer reliability was not assessed before the start of this study which is a limitation.

Interviews

The process of interviewing involves collecting data through talking to participants, in this case the face to face method was used. Face to face interviews are beneficial because the researcher is able to query and probe if necessary, ambiguity and misunderstandings. Often they can provide rich, quotable data which can enhance final reports and publications (Bowling, 2009:286). A semi-structured interview was chosen; the questions were structured by the observational data and individual to each interview, but open ended to allow in-depth response (Fontana and Frey, 1994:365). Structured interviews would not have been appropriate as they would not have allowed the participants to express their own perceptions and would have required the interviewer to follow a set list of questions, disallowing probing and clarification (Fontana and Frey, 1994:364).

Green and Thorogood (2014:106) highlight that interviews do not create data about behaviour or interactions other than those caused by being interviewed. The dual aspect of the design of this study negates this limitation as the interview data will be analysed in conjunction with 'real world' observational data. The perceptions generated by participants will also be vital in the empirical level of critical realism interpretation.

The interviews were conducted within one of the quiet rooms on PCC, away from the inpatient environment. Nursing care for that patient was provided by another PCC nurse to ensure safety was not compromised. The interviews lasted between 21 and

48 minutes and were recorded to allow verbatim transcription. The observational data determined the questioning accounting for the difference in length of interview, the table below (table 6) summarises the data collection process.

Table 6 Data collection process

Observation	Day and Time	Interview	Day and Time
1	Saturday 09.00 -11.00	1	Saturday 14.15
2	Saturday 11.55-14.00	2	Saturday 15.10
3	Sunday 08.40-10.45	3	Sunday 13.30
4	Tuesday 08.30-10.35	4	Tuesday 14.00
5	Thursday 11.30-13.30	5	Thursday 19.00
6	Saturday 10.20 – 12.45	6	Saturday 13.45
7	Thursday 08.40-10.40	7	Thursday 14.20
8	Sunday 08.55-10.55	8	Sunday 11.30
9	Tuesday 12.15-14.05	9	Tuesday 14.15
10	Friday 10.50 – 12.30	10	Friday 19.30

This table demonstrates that all observations and interviews were completed during a 12-hour day shift, which included both weekdays and weekends. They were not carried out overnight due to the unavailability of extra nursing staff to care for the children during the interviews. There were two occasions when the interviews occurred six hours after the observation period, this was caused by multiple emergency admissions which ensured all nursing staff were busy and it was not safe to conduct the interview.

3.6.3 Data analysis

Framework analysis was chosen to facilitate the data analysis process. Framework Analysis is similar to thematic and content analysis (Gale et al, 2013). All of these approaches analyse the data by looking for similarities and differences within the data, before identifying relationships within the data to help develop descriptive or explanatory conclusions (Gale et al, 2013). The identifying feature of this method is the matrix which is produced which helps to reduce data so that it can be examined systematically by both code and case (Smith and Firth, 2011 and Gale et al, 2013). It also includes analysis of key themes across the whole data set, this combination allows the data to be examined as whole but embraces the views of the individual research participant (Gale et al, 2013). It is a useful analysis tool for this study as it requires data which is focused on one topic and is often used with semi-structured interviews and can easily be adapted for observational data (Gale et al, 2013). The stages involved in this process within this study have been summarised in table 7 below.

Table 7 Stages within Framework Analysis

Stage	Description	Benefit to analysis
Stage 1	Interviews transcribed by the researcher (see appendix 5)	Allows the researcher to immerse herself in the data (Gale et al, 2013)
Stage 2	Familiarisation with the interview	Repetitively reading the interview transcriptions allows the researcher to begin to note first impressions of the data (Gale et al, 2013)
Stage 3 (a)	Coding (1st Stage) of five transcripts: Using inductive methods data was coded using descriptive	Bazeley (2013:125) describes coding as the means of identifying, sorting and managing data. It allows

	coding. This descriptive coding identified the master codes. Inductive coding was chosen to allow the individual interview data to drive the analysis. (see appendix 6) This stage was verified by supervisor reviewing 2 transcripts in depth. Coding then applied to 5 remaining transcripts and field notes (see appendix 7)	the researcher to access the data. Descriptive coding summarises the topics identified within small passages of qualitative data (Saldana, 2013:262). Deductive (using pre-set codes) or inductive coding (identifying anything that may be relevant) may be used within this framework. (Gale et al, 2013)
Stage 3 (b)	Coding (2nd Stage) Master codes were reduced to sub codes and comprehensive definitions written.	This stage reduced master codes to one or two words which could be abbreviated.
Stage 4	Master codes grouped in to category trees resulting in 4 overarching themes: • Guiding the medication process • Concentration, focus and awareness • Influences on interruptions • Impact and recovery	With comprehensive definitions codes can be grouped into category trees (Gale et al, 2013)
Stage 5	Critical realism lens applied to category trees (See figure 3 below)	This is an adaptation to the process and ensures the three levels of stratification identified within Critical Realism are applied to the analysis.
Stage 6	A matrix was produced for each overarching theme. Evidence from each case inserted into the matrix to support each sub code that forms part of the overarching theme. (see findings)	This stage of the process ensures that each individual case contributes to the evidence presented for each code within a category tree. It allows the participants own expressions to infiltrate the interpretation (Gale et al, 2013)
Stage 7	Analytical memos produced for each overarching theme (see appendix 8)	These allow the data to be related to theory and allows the mapping of relationships and causality (Gale et al, 2013).

The following themes (table 8) were identified using Framework Analysis.

Table 8 Category Trees using a critical realism lens

Guiding the medication process	**Definition** – knowledge, actions, comments, which are structured by policy, codes, checklists or interventions
Critical realism lens applied	**Associated codes**
Empirical (human perceptions of what's actually happening?)	Effective Intervention Ineffective Intervention Being Seen as Rude Medication as a Priority
Real (structures and systems which appear underneath appearances)	Impact of Knowledge Maintenance of Professionalism Missed Opportunity
Actual (events and outcomes that occur in the world)	Patient Safety Check Medicines Management Non-Adherence to Policy

Focus, Concentration and Awareness	**Definition** – nurses ability to increase and decrease concentration, focus and awareness
Critical realism lens applied	**Associated Codes**
Empirical (human perceptions of what's actually happening?)	Interruption Awareness Ability to Dual Focus Ability to Focus on Primary Task
Real (structures and systems which appear underneath appearances)	Desensitisation to Interruptions Conversational Influence
Actual (events and outcomes that occur in the world)	Responding to Patient Condition Fluctuating Levels of Concentration

Influences on interruptions	**Definition** – variables which influence the impact or reaction to interruptions
Critical realism lens applied	**Associated Codes**
Empirical (human perceptions of what's actually happening?)	Learning from Experience Impact of Change Drug Complexity Impact of Errors Impact of Role Parental Influence Saving Time
Real (structures and systems which appear underneath appearances)	Impact of Normal Personal Touch Acceptance of Culture
Actual (events and outcomes that occur in the world)	Communication Preparation and Planning,

	Impact of Environment Impact of Experience Teaching versus Administration

Impact and recovery	**Definition** – comments, actions or reactions that indicate the impact of interruptions and strategies nurses use to carry on with medication task.
Critical realism lens applied	**Associated Codes**
Empirical (human perceptions of what's actually happening?)	Impact of Interruption Recovery Strategy Visual Impact Safe Time in Place
Real (structures and systems which appear underneath appearances)	Creation of Frustration
Actual (events and outcomes that occur in the world)	Verbal Confirmation Actions Repeated Checks Attempt to Reduce or Prevent Interruptions Delay, Deflect or Downgrade Interruptions

3.7 Ethical Issues

3.7.1 Ethical Review

Following Health Research Authority Guidance (see appendix 9) review by National Health Ethics was not required, however, ethical review was performed by Coventry University (see appendix 10). Permission was granted by the Trust Research and Innovation department (see appendix11).

3.7.2 Informed Consent

Each participant within this study was asked to consent as per Good Clinical Practice Guidelines (NIHR, 2013) with the use of consent interviews and participant information sheets. This ensured that all individuals volunteered to participate and were fully informed (Green and Thorogood, 2014:70) and were aware they could withdraw at any point (Robson, 2011:297). Nurses consented to either be observed and interviewed or just observed. Parents were asked for their permission for the researcher to be present within their child's bed space. The child was ventilated and sedated so unable to consent.

3.7.3 Participant Harm

The participants within this study are the PCC nurses who consent to be observed and interviewed. One of the central principles of any research study is non-maleficence; to do no harm (Beauchamp and Childress, 2001:12). There was a potential risk identified within the research protocol (see appendix 3) that participants may become upset during the interview if issues of previous or current medication errors were raised. If this occurred time would be given to allow the participant to consider whether to continue with the interview. Support would have been offered from senior staff within or outside PCC, chaplaincy staff or counselling services depending on the participants wishes. When appropriate it would also have been clarified with the participant whether the data already collected could still be used or whether they wished it to be discarded.

3.7.4 Patient Harm

Within the observation section of the study there was the possibility that the researcher would observe a medication error. It was essential that as a qualified experienced PCC nurse, the researcher adhered to her professional code of conduct (NMC, 2015) to maintain the safety of the child. This was clearly documented within the participant information sheet so that the nurses under observation were aware of this.

If the researcher observed practice that did not adhere to policy or meet the correct standard, the researcher would discuss this with the nurse at the end of the interview. If these issues were widely observed non-identifiable feedback would be shared with the wider PCC team.

3.8 Quality and Rigour

Methodological rigour is essential to achieve best practice in research (Maggs-Rapport, 2001). To achieve this within qualitative research issues such as credibility and, transferability, and reflexivity must be evident within the study (Streubert and Carpenter, 2011 and Santiago-Delefosse et al, 2016).

To achieve credibility, the relationship between the theory, research questions, data collection and analysis methods must be logical and explicit (Santiago-Delefosse et al, 2016). Within this study, links have been made between theory and practice to

demonstrate justification for the method chosen. It is essential that the findings are authentic and represent participants' perceptions (Miles and Huberman, 1994:278). Framework Analysis assists with credibility by ensuring the participants voice is paramount. The comparison of interview and observational data will triangulate the data reinforcing credibility within the study.

Credibility was also increased by the verification process within the study, feedback on technique was requested after two interviews and the coding process was cross checked by a supervisor. Transparency is also evident within Framework Analysis due to the systematic process which increases rigour and contributes to credibility (Smith and Firth, 2011 and Ritchie and Lewis, 2003).

Transferability refers to the generalisation of the findings to other contexts (Santiago-Delefosse et al, 2016 and Miles and Huberman, 1994). This study explored behaviour and perceptions in a single unit and these are likely to be unique to this environment. However, there is a clear audit trail within the Framework Analysis to allow readers to establish whether the findings are applicable to their own environment.

Reflexivity demands that the researcher demonstrates understanding about their relationship with the participants (Santiago-Delefosse et al, 2016). Within this study the researcher was an insider, investigating an issue within an environment where she had previously worked (Gair, 2012). Morse (1994:222) highlights the issues of being an inside researcher, she states that an investigator should not conduct research within their own work environment. She believes there may be occasions where the

investigator has access to information that an employee should report and an ethical researcher should keep confidential. The clarity provided in the PIS ensured that all participants were aware that errors would be reported and practice issues address through education, before they consented.

Another issue is that in times of pressure the team may expect the researcher to work rather than continue to collect data (Morse, 1994:223). To counteract this, the researcher was allocated a prolonged period of study leave before the research was conducted, so that she was not rostered to be a team member, and had relinquished all line management responsibilities for the 4 months preceding the start of data collection. When collecting data, the researcher also adhered to the non-clinical uniform policy, which meant that she was not in a recognised nursing uniform as recommended by Morse (1994:223).

Trustworthiness is essential in research so it was important that the researcher collected data that recorded the actions and relationships as they actually happened rather than her perception of the event (Dougherty, Sque and Crouch, 2011). Before the study began the researcher documented her ideas about the medication process and causes of interruptions (see appendix 12) as part of her reflexive diary to ensure that it was not her own perceptions she was presenting in her findings (Streubert and Carpenter, 2011). A reflexive diary was maintained throughout to allow the researcher to examine her own perceptions and their impact on the research and have an awareness of their impact (Ortlipp, 2008). When analysing the data, a code was allocated for researcher impact so that it was transparent when this occurred and its

influence examined. During the analysis phase it was essential that the researcher did not allow familiarity and empathy to influence deeper interpretation of the data (Asselin, 2003).

3.9 Summary

This chapter linked philosophy, theory and method to present a comprehensive rationale for the process followed. It demonstrated that the study was trustworthy, ethical, credible and rigorous, all of which were essential in ensuring that best research practice was achieved.

Chapter 4

Findings

4.1 Introduction

The aim of this study was to critically explore and understand PCC nurse decision making when interruptions occurred during medication administration in the critical care environment. The method identified in Chapter 3, allowing real life situations to be interwoven into the semi-structured interview supported the researchers' positionality that nurses actions and thoughts are influenced by the world that they work in (see Chapter 1). As a consequence, it was thus important to select an analysis method which allowed individual participants thoughts and actions to be the focal point of the process.

The extensive reflective observations and 10 interviews created a large amount of qualitative data which needed to be treated fairly and without bias to provide trustworthy interpretations (Robson, 2011:372). Further, Miles and Huberman (1994) purport that any techniques employed should be credible, dependable and replicable in qualitative terms. Therefore, in relation to this study as described elsewhere in Chapter 3, Framework Analysis was used which sought, it to identify commonalities and differences within the data before seeking explanations which supported the themes proposed by the researcher (Gale et al, 2013).

The category trees presented in Chapter 3 summarise all of the findings, the following narration relates to those findings which are novel to this study. An example of the matrices which support these themes are located within appendix 13. A summary of the observed medication process has been included to illuminate the procedure.

4.2 The observed medication process

The medication process was observed to be a multiphase, extensive, time consuming process. It could on occasions last up to 50 minutes, with a mean of 27 minutes. The maximum number of interruptions recorded was 27, with a mean of 11. The episodes involved the preparation of multiple, complex medications, some of which maintained the cardiovascular stability of the patient. All the medication administration episodes observed involved two nurses. It was common for medication vials/bottles to be located before both nurses were present and ready to prepare. The prescription charts appeared to be a prominent visual adjunct as they were presented by the primary checker to the secondary, to read the patients name, hospital number, weight and allergy status. There appeared to be three phases in the process; planning, preparation and administration. However, inconsistencies (as listed in the box below) in the content of these phases were observed, these were caused by issues such as arrival of parents, nurse choice or change in patient condition. These inconsistencies on occasion would remove the structure of the procedure. An example of this was recorded within the reflective diary *'there appeared to be no structure to the checking procedure, the primary nurse interrupted herself half way through the preparation of*

the drug to check the dilution guidelines in the IV administration guide' (Excerpt from reflective diary). Interruptions and decision making contributed to these inconsistencies which then compromised patient safety.

Checking of dose or dilution during in planning or preparation phase
Patient ID checked during planning or administration phase
Pump programmed during preparation or administration phase
Explanation of drugs to parents during preparation or administration phase
Locating of equipment during any phase of the process

4.3 Guiding the medication process

The medication process was verbalised as a priority activity within PCC. The safe administration of medication appeared to be a priority within patient safety. Maintenance of the child's airway, breathing and circulation were described as the essential elements of patient safety, immediately followed by medication administration. Eight of the nurses interviewed identified that 'medications' as a task was pivotal in the planning of nursing care for the whole shift. Nurses discussed planning tasks like pressure area relief and hygiene in between periods of medication administration. However, this perception of medication administration being a priority cannot be visualised in the decision making process when interrupted. There were multiple occasions when responding to interruptions was prioritised over the administration of medication.

One of the novel concepts that emerged was a perception that responding with silence, when interrupted, was unacceptable. When dealing with interruptions it was important to nurses that they did not appear to demonstrate an attitude that could be interpreted as rudeness. It was perceived that they would be viewed as being rude if they ignored the other person, *'you almost have to acknowledge them em so you are not coming across rude'* (Interview 9 line, 135). Interestingly when nurses did respond with silence it caused discomfort, they felt that they had to apologise afterwards even though it was evident that they were in the middle of preparing or administering a medication. These feelings were consistent whether the nurse was interrupted by another member of staff or a parent, *'you do feel you know obliged to answer because they are worried about their child and you've got to answer their questions although that's quite distracting'* (Interview 10, line 124-126).

There was also a perception from three nurses that if silence was the response to a question the interrupter would think that the nurse had not heard their question. It was felt that this would lead to more questions and interruptions. This was evident when one nurse described the decision making process when she was interrupted programming a pump, *'so I was aware that I was in the process of programming the pump and she'd asked me a question, however, I knew I was nearly at the very end of administrating the drug so for the sake of 10 seconds I would be finished and I would be able to address what she was saying but I didn't want it, it's a little bit difficult cause I didn't want her to think I hadn't heard what she was saying'* (Interview 3, line 129-132) The key result of this process was that the full conversation was delayed until after the medication process had been completed without demonstrating a behaviour that could be perceived as rude.

One of the key issues that emerged surrounding the medication decision making process was the nurses' knowledge of pharmacology. The presence of knowledge created feelings of comfort with the process, *'I checked the dosages were fine for the age and things, so I felt quite comfortable before I started.'* (Interview 4, line 51-52). However, one of the side effects of owning the knowledge was that nurses would choose not to check medicine doses, because they 'knew the dose', *'we didn't because we know that's 50/kg so through experience I know that's 50/kg'* (Interview 3, line 153-154).

Conversely, a lack of knowledge was observed to create internal and external interruptions. An internal lack of knowledge created a need for the nurse themselves to clarify information. In this position the nurse can control when to create this interruption so that it occurred at an appropriate time. It appeared that when lack of knowledge created an external interruption to the medication administration process the nurse had no control and had to choose an appropriate response which minimised the impact on medication safety, *'if I'm doing something that's like quite complicated and they come then I'll just say I'm just doing this can you wait a minute?'* (Interview 6, line 88-89).

4.4 Focus, concentration and awareness

Focus and concentration within the medication administration process were observed to fluctuate significantly. There were periods where all nurses looked relaxed, with their body positioned in an upright stance and no evidence of facial tension. They also had an awareness of their patient's condition and of the environment around them, this was demonstrated by frequent glances at their patient or nearby bed spaces. This decrease in concentration was frequently associated with periods within the medication process when the task was viewed as simple, for example 50mls of plain solution were aspirated from a bag of fluid.

In contrast, there were occasions when they were bent over their trolley reading or using a calculator when their faced looked tense and almost unapproachable. These periods were described by eight nurses as periods of 'zoning out' all background noise would be filtered out and only critical alarms or shouts for help would be responded to as highlighted in the quote below.

Within the observation today I watched two nurses administer both drugs they were familiar with and one that was new to them both. I was surprised by the change in demeanour that was displayed between the episodes. When the unfamiliar drug was prepared, they were very focused, hunched over the BNFC, clarifying information between them, checking and re-checking and then midway through drawing up went back and checked again. When preparing familiar drugs, they were more upright looking around the unit, watching all 3 of the patients they were caring for. The levels of concentration were not at all equal. (Reflective diary excerpt)

There were occasions when there was a significant lack of awareness of interruptions, *'I wasn't interrupted enough to be aware'* (Interview 3, line 92). If nurses do not realise they are being interrupted they are unable to make informed decisions about how to safely manage interruptions. Five of the nurses interviewed discussed their lack of awareness of interruptions and were surprised at how many interruptions had been recorded in the field notes. Several nurses interviewed identified interruptions that occurred during the preparation phase, which prevented the start of the process, but they then felt that they had not received any further interruptions when in fact they had experienced many interruptions during the process. This indicated that awareness of interruptions was present during the preparation phase and decreased once the physical part of the procedure began. During the preparation phase, increased focus was observed, several of the nurses appeared to be more aware of interruptions if these broke through the increased level of concentration.

There was an indication in many of the interviews that it was 'normal' to experience interruptions during medication administration. One interviewee noted that it felt like a normal level of interruptions, when 11 had been documented. This indicated that there was a high tolerance of interruptions, to the medication process and it was accepted without question as exemplified;

'the infusions I felt that we were interrupted a little bit more than normal but they're the same things that people wanted so I think it's just because it's a busier shift. But I would of, I have previously been interrupted for the same things, for the keys, for someone wanting to get in your IV trolley or conversations between ourselves. It felt quite standard'. (Interview 4, line 64-67)

This desensitisation to interruptions is an underpinning structure to the lack of awareness. There appears to be a concept of interruption fatigue, which is similar to that seen when nurses are exposed to frequent alarms (Sowan et al, 2015).

4.5 Influences on interruptions

Teaching at the beside is a fundamental role within nursing and medication administration is no exception (White and Ewan, 2013:20). Undergraduate student nurses were observed receiving education and experience in checking medication on three occasions. This process created a situation which stimulated questions and discussion and the focus moved from patient focused medication to a general conversation about the medicine. However, when questioned about teaching medication skills, two nurses highlighted that it increased the safety of the process as they were more conscious of what they were doing and more likely to adhere to policy. This is not acceptable practice as all medication administration should be delivered at the same standard (NMC, 2007).

On several occasions undergraduate student nurses were also asked to perform actions or hold conversations on behalf of the registered nurse in an effort to reduce interruptions to the medication process. These actions demonstrated a decision making process which attempted to reduce the impact of the interruption. The student would be asked to perform a task which stopped the nurse from having to break away from the medication process completely, therefore reducing the impact. However, this delegation of jobs creates a different interruption as the registered nurse has

responsibility for that student and they are required to watch or listen to the conversation to ensure it is completed correctly. This often created a situation where the nurse carried on with the medication process but also tried to listen to or watch the task they had delegated to the student. This may not have been in the best interests of that child, as 100% focus was not applied to either task. The flowing diary excerpt describes this, '*within the observation today, the nurse asked the student to answer questions from a Clinical Nurse Specialist (CNS), initially I thought this would be a good juggling act to ensure drugs were administered on time and communication with CNS would be timely. But I didn't anticipate the length of time the nurse would have to focus on two activities as she was administering the drugs and listening to make sure correct information was shared'.*

On two occasions qualified nurses new to PCC were also observed to receive information about medications and administration they may not have experienced before. Experienced nurses felt that this was appropriate and vital for patient safety *'so I guess it's part of it's part of the safety of checking of the drugs that she's asked a question she wasn't sure of*' (Interview 3, line 321-322). However, requests for education did not only relate to medication administration but to other clinical interventions such as oscillation ventilation, these requests were seen to be deflected to a more appropriate time.

When parents were present at the bedside observations demonstrated that they were involved in interrupting medication administration as demonstrated in the box below

Interruption 11

Whilst administering IV ranitidine dad showed photos of sibling.

Primary checker looked at photos while continuing.

Interruption 12

Dad commented that his son had a pink splint on.

Primary checker discussed this while flushing cannula (Observation 8 line 49-54)

However, two nurses commented about parents who waited until the medication administration had finished before asking questions. This was not information that appeared to be obviously shared with parents, however, it was common for nurses to say 'I'm just sorting out the medication, s/he is stable, I'll update you after I finish'. This tactfully suggests that medication time should not be interrupted. Several of the nurses interviewed discussed the stress that critical care parents are under and the need to try to relieve some of it, including within the medication process. Interruptions that were observed were stopping to comfort an upset or anxious parent, stopping to help a parent use Personal and Protective equipment and answering the door to allow parents in. When questioned about these interruptions the seven of the nurses stated that their priority was to care for the parent(s) and appreciate the stress that they were facing.

Change in process, resource or planning was perceived by the nurses interviewed to influence interruptions. They appeared to contribute to an underlying structure where the concept of familiarity and normality create comfort. Once out of their comfort zone internal interruptions occur as they decide how to deal with the change required. In

one situation the nurse had planned to administer intravenous antibiotics and was prepared for that, when she realised an inotrope was 30 minutes away from running out she had no choice but to change her plans *'my train of thought changed a little bit, we were going to draw up antibiotics but then we changed to do the inotropes first so we kind of had to probably think a little bit faster on our feet'* (Interview 9 line 99-101).

4.6 Impact and recovery

Eight nurses perceived that there were times within the process where it was safer to be interrupted. The process was observed to have three distinct phases, planning, preparation and administration. When nurses move from one phase to another nurses describe that their focus moves away from medication *'generally while I'm washing my hands I'm thinking about washing my hands because there's so many steps that you have to go through em like it can of naturally but I always have to consciously make sure that I'm doing each step of the handwashing'* (Interview 8, line 130-132). There was also an identified break between drawing up and administration, at this point the equipment for delivering the drug may be located. These were perceived to be safe points to interrupt as the accurate tasks of checking, calculating and measuring had been completed.

During the interview four nurses also indicated that they were more likely to decide to respond if they knew they were undertaking a task that would be checked again as part of the process. Repeated checks were commonly seen when nurses were dealing with unfamiliar or complex drugs as reassurance was sought to ensure correct

administration occurred. When repeated checks are completed with full concentration they add another layer of safety to the process, however, if interruptions were readily accepted at these points it created a risk as focus was not consistent through the task.

Within the medication process there were occasions when a verbal talk through occurred, for example verbalising a step by step process when infusions were administered which required the pump to be programmed or teaching a student how to check a medication. When observed, these actions were identified as interruptions as the verbalisation of the process may have affected the checkers concentration. However, the nurses involved in those situations perceived that it added to the safety of the situation *'often I will speak out loud about things like that so that whoever's checking it with me it's like a confirmed talked through process'* (Interview 3, line 121-122). This process was observed to actively engage the checker in the process of programming the pump, whereas in other checking situations the checker would passively watch the programming and be more likely to respond to interruptions.

Impact of interruptions and recovery were observed be affected by underlying frustrations. Those feelings were seen to be created by a variety of stimulants, the drug itself, staff availability and their skill set and an uncontrollable environment. Often situations which created frustration lengthened the medication process allowing more interruptions to occur. The actual emotion attached with frustration appeared to create interruptions, for example a drug that does not dissolve encourages vigorous shaking and a conversation about why it will not dissolve. The lack of available staff to check medication was particularly relevant when patients were located in side rooms, this was exemplified by the following quote; '*I think it was a bit challenging to get someone*

to come and check my medication cause I was in a side room. Em so although I was planned in advance and had sent my student to get the medications that I needed I wasn't able to, to do the medications until I had someone to check them with me so I think em that did affect things' (Interview 8, line 49-52). In situations like this one, nurses were observed to start the checking process on their own, in an effort to save time when the checker was available and to ensure timely administration of medication. However, this strategy was flawed because the process was then not completed with full concentration and interruptions responded to because it was assumed checks would be repeated when the checker arrived.

4.7 Summary

The findings from this study demonstrated that safe medication administration within PCC was compromised by interruptions. The decisions made by PCC nurses when interrupted influenced the impact of interruptions on medication safety. The findings also identified that medication administration was not the priority it was perceived to be by the nursing team. However, it was highlighted that within this environment there was a lack of awareness and tolerance of interruptions. This indicated that it was difficult for nurses to make decisions that could minimise impact if they were unaware of the interruptions in the first place. The use of the critical realism lens has identified the underlying structures which influence nurses when decision making during medication administration. Gaining understanding of these invisible structures will help to inform the design of a 'real world' intervention to improve decision making when interrupted.

Chapter 5

Discussion

5.1 Introduction

This chapter will interpret the findings (presented in Chapter 4) and existing research with the aim of illuminating original insights from this study. Findings, wider literature and theory will be discussed in relation to the research question and objectives presented in Chapter 1. Although these will be presented in separate sections, it must be acknowledged that novel insights from this study could not be completely separated due to the complexity and multidimensional nature of the phenomena under investigation and therefore some overlap is unavoidable.

5.2 Decisions made by PCC nurses when interrupted during medication administration

The findings from this single site study indicate that the overall process for medication administration was inconsistent. Examples of nurses deviating from the policies include: doses and dilutions being checked at different times: medicines being grouped together according to individual nurse choice: and replacement timings of infusions being extended. However, identifying inconsistent practice is not unique to this study. Deviation from policies was also noted within other empirical studies, with

inconsistent practice attributed to the environmental and human factors, workload and experience (Murphy and While, 2012 and Alomari et al, 2015). However, findings from this study indicate that clinical judgement also appears influential within the decision making process.

Clinical judgement is an essential skill required by all nurses, it allows nurses to rationalise their actions using or adapting standards in response to a patients' condition (Tanner, 2006). The reasoning process within clinical judgment allows the nurse to make decisions which are in the best interests of their patient (Tanner, 2006), requiring the nurse to assess their actions and the impact on patient safety. For example, grouping medications together to reduces central line access and contributes to lower rates of infection (Frasca, Dahyot-Fizelier and Mimoz, 2010). This situation demonstrates a conflict of interest between administering medication on time and reducing the risk of a central line infection. On occasions it was evident from this study that nurses chose to adapt the medication process to reduce the risk to the child. Interestingly, this highlights the extensive knowledge required by PCC nurses as they make clinical judgements concerning patient safety as a holistic concept rather than individual elements such as medication safety. Tanner (2006) highlights that clinical judgment is influenced by the culture of the unit, the nurse's knowledge and their experience. Within the findings it was evident that clinical judgements were informed by experiences and knowledge of both the patient and medication. Eisenhaur, Hurley and Dolan (2007) who documented that nurses use extensive critical thinking and clinical reasoning to provide safe and effective care when administering medication.

Within the findings it is evident that clinical judgements were influenced by Trust Medication policy (Nottingham University Hospitals Trust, 2016) and the NMC's Standards for Medicines Management (2007). The essence of these guidelines were demonstrated by the use of salient checks (known as 5 Rights). Interestingly, although observed behaviour noted that they were practiced in an inconsistent order, the use of these guidelines was not verbalised during interview. Thompson et al (2013) discuss the popular use of clinical guidelines to support decision making within nursing, noting that key messages provided by these documents become internalised affecting the reliability of the recalled information. This was evident in the findings as the salient checks were recalled but implemented differently by each nurse.

The findings have indicated that policies and guidelines influence nursing practice in relation to medication administration. Polit and Beck (2008:34) note that when following guidelines, it is important to appraise the evidence base which informs the recommended practice. Appraisal of the Standards for Medicines Management (NMC, 2007) reveal that it is nine years old, demonstrating that the evidence base is now out of date. The Trust policy was revised at the beginning of 2016, despite wide consultation it is supported by a limited evidence base. The identification of the poor evidence base within these benchmarks indicates that nurses are not informed by appropriately researched guidelines. The findings from this study indicate that nurses may benefit from guidance in reducing unnecessary interruptions. The Trust Policy and Standards for Medicines Management (NMC, 2007) could offer improved guidance if interruption management was incorporated, as it may raise awareness of the issue and highlight that interruptions should be an exception to the norm.

As identified in Chapter 2, decision making when interrupted during medication administration is a complex process involving interruption handling strategies (Colligan and Bass, 2012, Dougherty, Sque and Crouch, 2011 and Sitterding et al, 2014). The four main handling strategies proposed by the literature include: blocking: multitasking: mediation and engagement. Although the actions of PCC nurses have not been specifically reported in previous empirical research, findings from this study identify that all four of these strategies were used.

In contrast to the existing literature, this study, through a critical realist lens, has also illuminated underlying structures and perceived factors that influence decision making. This has provided novel understanding as to why certain strategies are applied by PCC nurses and factors that are influential. It is evident within the findings of this study that engagement, mediation and multitasking are used regularly. However, blocking was used less frequently when the interrupter was a person, rather than a machine. When it was employed some nurses appeared to feel uncomfortable. This reluctance was associated with the concept of being seen to be rude. Jaworski (1993:5) within the field of linguistics discussed the power of silence within language highlighting that it can be interpreted as a hostile reaction to a question. In contrast, Leigner (2003) states that silence can also be a form of communication, in this situation the nurse is communicating that they need to concentrate and cannot respond. Yet, Chan (2013) identifies that non-verbal actions must be easily understood by receivers otherwise this could lead to misunderstanding. Nurses interviewed perceived that not responding to interruptions was potentially detrimental to both professional working relationships and communication with families which are essential for providing holistic care for the child. This aligns with the theory that non-verbal communication is easily

misunderstood (Chan, 2013), nurses may choose not to use the strategy of blocking as it may be misinterpreted as a sign of rudeness which may influence relationships negatively.

Nurses report and demonstrate within this study that responding to parent need is essential in an area such as PCC due to the stresses that families feel. Despite a plethora of literature in relation to parental involvement in care within the critical care environment (Latour et al, 2011, and Melnyk et al, 2006), there is no published empirical research which has examined parental influences on medication administration. Colligan and Bass (2012) present the argument that the family centred approach within paediatric environments prioritises interruptions that are generated by parents, which is evident within the findings of this study. However, within the empirical research which embraces parental views of family centred care it is clear that parents would not want their needs to be the priority. Shields (2010) identified that parents wanted to know that their child was receiving the best care possible and parental needs should be dealt with after that. Butler, Copnell and Willetts (2014) who note that families value being able to trust the nurse however, receiving information is an essential aspect of family centred care. It is evident within the findings of this study that parents do interrupt the process and there are inconsistencies in the information about medication and the process that they receive. Unfortunately, it is not documented within the literature what information families would like to receive and when it should be delivered. Reducing parental interruptions may enable the nurse to deliver a safer medication process which would be in the best interests of the child as paediatric nurses are expected to be an advocate for the child they are caring for (Spence, 2011).

5.3 Factors which influence decision making when interrupted during medication administration

Study findings have identified that decision making when interrupted is influenced by many factors; the process, environment, knowledge, drug complexity, familiarisation, experience, culture and concentration level. Li, Magrabi and Coiera (2012) describe different cognitive levels associated with procedural, problem solving and decision making tasks. It was identified within this study that some phases of the process have greater levels of concentration that others. When calculating or making decisions, interruptions appeared to be more likely to be ignored or deflected, whereas when nurses are performing an automated process they feel more inclined to respond to interruptions as they have spare attentional resources (Sitterding et al, 2014). These different cognitive levels were identified within the findings of this study, but in addition it was also noted that nurses perceive that the multiple levels of concentration within the process influence their response to interruptions. Whilst calculating a dose they were more likely to block an alarm, but when completing an automated task such as drawing up saline they would engage, mediate or multitask to deal with an alarm.

It was evident within the findings that there were periods of time when concentration was at its maximum. This was usually associated with a calculation, dilution decision or the programming of a pump. On these occasions their facial expression and body language appeared to demonstrate complete focus on the task. Findings indicated that when the complexity of the medication was increased or unfamiliar, nurses described being in a ‘zone’ where all background noise was filtered out. Interestingly,

this ‘zone’ is similar to the ‘sterile cockpit’ intervention that has been trialled within the literature (Anthony et al, 2010 and Colligan et al, 2012). Criticism of this intervention within the literature was that it reduced the frequency of all interruptions which then impacted on communication and teaching. Furthermore, it was evident within this study that the ‘zone’ was used less frequently when teaching occurred as explanation of the process would be offered to the student. Environment did not appear to influence the use of the ‘zone’ as it was observed in action in both a quiet side room and a noisy, busy environment.

The findings have indicated that there appears to be an undulating process of concentration within medication administration. One theory that offers an explanation to this observed undulating process is the concept of mindfulness and flow (Reid, 2011). This theory proposes that when an individual is totally engrossed with a task, they forget the world that surrounds them and mindfulness refers to the awareness of the present moment in time (Reid,2011). Embracing the concept of flow within an intervention for essential parts of the process such as decision making, calculations and measurements may allow response to patient condition to be at its heart.

Findings revealed that nurses perceived interruptions during medication administration became normalised. This was observed, described in interviews and rationalised by nurses into the decision making process, culminating in a culture which allowed, accepted and promoted desensitisation. As identified by Colligan and Bass (2012) who found a culture of interruption acceptance, highlighting that nurses were willing to engage with interruptions.

Although the term of ‘interruption desensitisation’ appears novel within the literature, it seems to have similar characteristics to that of ‘alarm fatigue.’ Cvach (2012) identified that desensitisation occurs due presence of a high false alarm rate and that impact of this phenomenon is noted to disrupt workflow and contribute to errors, which is confirmed by the findings from this study. Interestingly, despite the potential risk, study findings identify that nurses not only accepted interruptions but had a lack of awareness that they had been interrupted when asked to recall the events. However, when reminded of interruptions nurses were able to recall decisions they had made, the rationale for them and their impact.

5.4 PCC nurses’ views about the efficacy of decisions made when interrupted during medication administration

Within the findings it is evident that nurses perceive medication to be a priority activity but this is not always supported by the actions observed. It is perceived to be a task that should be delivered in a safe and timely manner. Medication timeliness is particularly promoted by care bundles such as those used for the treatment of sepsis, which is especially relevant within PCC, where IV antibiotics are required to be administered within one hour. There were occasions when patient instability had to be prioritised before medication, equally there were non-essential interruptions, for example non-medical conversations when medication should have been the priority. Sitterding et al (2014) noted that engagement was the most frequently used handling strategy, where the interruption is a higher priority task. This aligns with the findings which demonstrate that there are occasions when patient safety requires a response

to the interruption, such as an acute change or deterioration in patient condition. Conversely, there are occasions when interruptions from other professionals are tolerated too easily and these need to be challenged by the nurse who is responsible for the delivery of safe medication (Colligan and Bass, 2012 and Biron, Lavoie-Tremblay and Loiselle, 2009).

The perception that medication administration is a priority activity is supported and demonstrated by its use as a structure which supports the plan of care for the day. Jennings, Sandelowski and Mark (2011) describe this as the temporal structure, where the shift is viewed positively if medication is delivered on time. Interestingly Chan et al (2013) found that nurses viewed the completion of tasks on time as being efficient. However, the findings within this study indicated that although medication administration structured the day, multiple interruptions to the individual episode delayed medication administration reducing efficiency.

The findings of this study identified the benefits of verbal confirmation of actions. Several nurses perceived that the clarification of key elements: medication name, dose and concentration between the checking nurses improved the checking procedure as it ensured the participation and focus of both nurses. It appeared that this strategy ensured that both nurses are focused and engaged with a task which resulted in fewer responses to interruptions. In the anthropological literature verbal communication is viewed as an art form and language is noted to attract attention (Bauman, 1975). Attention is demanded within the process of medication administration; verbalisation

of key elements may contribute to increased safety for the child by ensuring two nurses are focused on the task.

5.6 Summary

The findings discussed within this chapter offer novel insights into the complexity of handling interruptions during medication administration within PCC. The use of theory and literature from other fields such a linguistics, anthropology and occupational therapy offers explanation for some of the observed actions and perceptions. The use of the critical realist lens has allowed underlying structures to be illuminated which offer novel understanding of the complexity and interplay of nurses' perceptions, decisions and contributory factors in relation to this phenomenon.

Chapter 6

Conclusion

6.1 Introduction

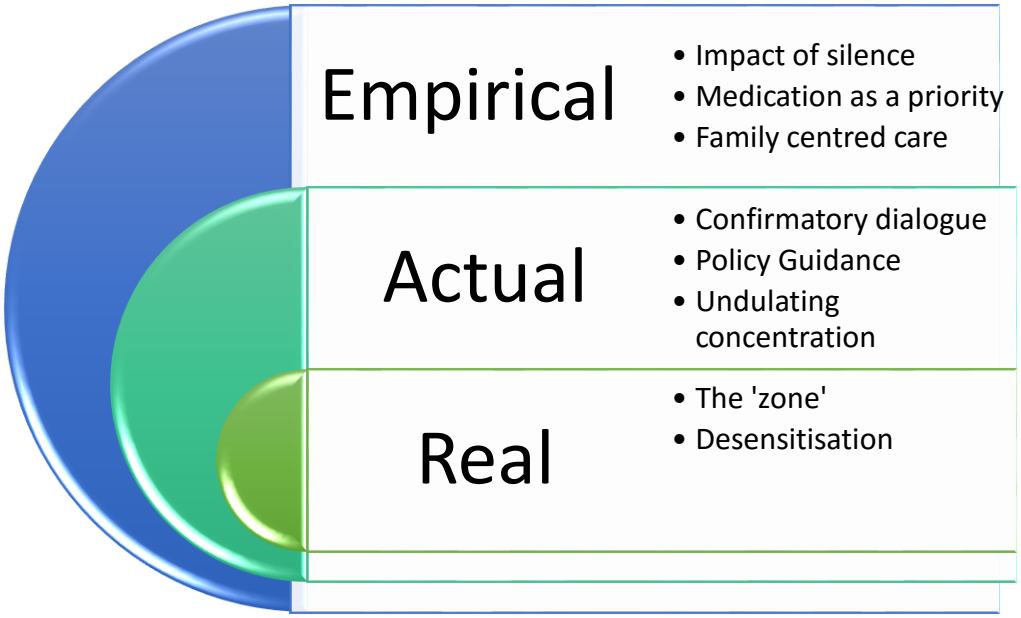
Medication administration within PCC is an essential element of the treatment plan required by the child (Dickinson et al, 2012). The critical nature of their illness increases the complexity of the process. Interruptions result in a change in thought process which can impact on focus and concentration (Laustsen and Brahe, 2015). Within the context of medication administration, they can contribute to an increase in the risk of harm (Westbrook et al, 2010).

This study has critically explored PCC nurse decision making when interruptions occur during medication administration in the critical care environment. Through the use of observation and interviews data gathered has provided novel insights into the phenomena that transcend the actual, the empirical and the real.

The novel insights have illuminated an undulating process of concentration which creates its own ‘no interruption zone,’ and the importance of confirmatory dialogue as a safety check and the role of non-verbal communication in handling strategies. They have also challenged the perception of medication being a priority activity.

The method employed within this study used ‘real-world’ situations to explore the decision making process when interruptions occurred during medication administration. This method was informed by the researcher’s belief that reality affects the actions and behaviours of nurses. To understand the impact of reality in decision making it was important to collate individual interpretations of ‘real-world’ situations. The critical realist lens ensured that the detailed analysis of the underlying structures in reality were identified (see figure 3). The findings demonstrate that decision making is influenced by reality at all three levels but they are interpreted individually.

Figure 3 Critical realist presentation of novel findings



6.2 Study Limitations

There are a number of limitations to this empirical study that must be acknowledged. This qualitative study was conducted in a single unit which produces rich data relevant to one environment. The convenience sampling technique selected PCC nurses, which resulted in an all-female sample. The sample contained representation from all bands within the PCC nursing structure, however newly qualified nurses did not volunteer to participate. However, qualitative methods do not seek to identify statistically representative samples that can provide generalisation to a whole population, their aim is to provide thick description and rich data (Green and Thorogood, 2014:250). Detailed data analysis contributes to a rigorous empirical study (Miles and Heuberman, 1994, Bowling, 2009 and Robson, 2011). The use of Framework Analysis which is evidenced within this study (see Chapter 3), produced a detailed, staged approach. This analysis has produced inferences which are credible, therefore, the findings support themes and recommendations which are transferable to other PCC units (Green and Thorogood, 2014:252).

All observations were carried out during daytime hours to allow office based colleagues to care for patients while their nurse was interviewed and to gain permission from parents. Observations at night may have generated different data due to different environmental conditions. Nevertheless, the interview generated discussion where nurses drew on their experience of working throughout the 24-hour clock which helped to reduce the impact of this limitation.

With all studies that involve observation there is a risk that the Hawthorne effect will occur and natural behaviour will not be seen (Bowling, 2009:391). Researcher impact was evident within the observations as obvious comments were made by participants about the researcher being present. The researcher maintained awareness of their impact by coding it within the data analysis and maintaining a reflective diary.

6.3 Reflexivity

Conducting this piece of empirical research has allowed me to develop as both a professional nurse and a researcher. I have been able to critically explore a challenging question in a complex environment. As an insider researcher I was very aware that my own views would affect the interpretation of the data. I have acknowledged this throughout the study and tried at every opportunity to be a critical researcher rather than a PCC nurse. I found that using the critical realist lens helped me examine concepts and actions from different perspectives and these were very different to the views I had when I began the study.

6.4 Recommendations for practice

The discussion highlighted that policy documents contribute to the development of knowledge within clinical judgement. Currently medication administration policies do not include interruption management within them. Including this information would contribute to nurse knowledge and raise awareness of unnecessary interruptions.

Promotion of a culture where unnecessary interruptions are not tolerated and actions demonstrate that medication is a priority activity. The findings of this study indicate that his culture must extend to the whole of the multi-disciplinary team on PCC, as each profession can work to reduce unnecessary interruptions.

6.5 Recommendations for future research

It was highlighted in the discussion that the development of an intervention to reduce unnecessary interruptions will be required to embrace the needs of families. Unfortunately, there are no published empirical studies which examine their needs with regard to medication and its administration in a critical care environment. This will be needed in order to develop an intervention which will work in the real world of PCC.

A strategic intervention needs to be developed which reduces unnecessary interruptions to medication administration within PCC. The nurse needs to be able to respond to patient need due to the critical nature of their illness. Strategies such as ‘the zone’ and confirmatory dialogue may prove useful in structuring an intervention.

6.6 Recommendations for education

Nurse education regarding the administration of medication should include interruption management. This will help raise awareness of interruptions and develop skills to handle them. This education should also be shared within the wider multi-disciplinary team.

6.7 Summary

The children cared for within PCC are critically unwell, without the administration of medication they may not recover. This study has demonstrated that the decision making process used by the PCC nurse when interrupted during medication administration is influenced by fluctuating concentration levels, responding to the child and their family's needs and not wanting to be seen as being rude. It has also demonstrated that in relation to the concept of medication being a priority activity observed behaviours do not match individual nurse perceptions.

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Appendix 1

Search Results

EBSCOhost

COVENTRY UNIVERSITY

Search History/Alerts

Print Search History | Retrieve Searches | Retrieve Alerts | Save Searches / Alerts

☐ Select / deselect all | Search with AND | Search with OR | Delete Searches | Re

	Search ID#	Search Terms	Search Options	Actions
☐	S25	S17 AND S20	**Search modes** - Find all my search terms	View Results (764) View Detai
☐	S24	S17 AND S20 AND S21	**Search modes** - Find all my search terms	View Results (2) View Details
☐	S23	S17 AND S18 AND S20 AND S21	**Search modes** - Find all my search terms	View Results (0) View Details
☐	S22	S17 AND S18 AND S20 AND S21	**Search modes** - Find all my search terms	View Results (0) View Details
☐	S21	clinical decision making	**Search modes** - Find all my search terms	View Results (43,148) View D
☐	S20	interruptions OR distractions	**Search modes** - Find all my search terms	View Results (5,268) View Det
☐	S19	interruptions	**Search modes** - Find all my search terms	View Results (4,484) View Det
☐	S18	paediatric nurse OR childrens nurse OR pediatric nurse	**Search modes** - Find all my search terms	View Results (6,448) View Det
☐	S17	medication administration OR drug administration OR medication preparation	**Search modes** - Find all my search terms	View Results (1,203,141) View
☐	S16	medication administration AND drug administration	**Search modes** - Find all my search terms	View Results (38,657) View D
☐	S15	medication administration	**Search modes** - Find all my search terms	View Results (51,765) View D
☐	S14	medication administration	**Search modes** - Find all my search terms	View Results (51,765) View D
☐	S13	S7 AND S8 AND S10	**Search modes** - Find all my search terms	Rerun View Details Edit
☐	S12	S7 AND S9 AND S10	**Search modes** - Find all my search terms	Rerun View Details Edit
☐	S11			Rerun View Details Edit

		S7 AND S8 AND S9 AND S10	**Search modes** - Find all my search terms			
☐	S10	clinical decision making	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S9	interruptions	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S8	paediatric nurse OR pediatric nurse OR childrens nurse	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S7	medication administration OR drug administration OR medication preparation	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S6	medication administration OR drug administration	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S5	(MH "Drug Administration+") AND interruptions AND clinical decision making	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S4	(MH "Drug Administration+") AND interruptions AND clinical decision making	**Limiters** - Published Date: -20121231 **Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S3	(MH "Drug Administration+") AND interruptions AND clinical decision making	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S2	(MH "Drug Administration+") AND interruptions	**Search modes** - Find all my search terms	Rerun	View Details	Edit
☐	S1	(MH "Drug Administration+")	**Search modes** - Find all my search terms	Rerun	View Details	Edit

1. **Decision-making** processes used by nurses during intravenous **drug preparation** and **administration**.

(English) ; Abstract available. By: Dougherty L; Sque M; Crouch R, Journal Of Advanced Nursing [J Adv Nurs], ISSN: 1365-2648, 2012 Jun; Vol. 68 (6), pp. 1302-11; Publisher: Blackwell Scientific Publications; PMID: 21999334

Subjects: Decision Making; Health Knowledge, Attitudes, Practice; Infusions, Intravenous nursing; **Medication** Errors nursing; Nursing Staff, Hospital psychology

PDF Full Text

Appendix 2

Summary of articles included in literature review

Summary table of literature included in review

Authors and year	Title	Type of study	Strengths and weaknesses
Alomari, Wilson, Davidson and Lewis (2014)	Families, nurses and organisations contributing factors to medication administration error in paediatrics: a literature review	Systematic literature review	Strengths – clear search strategy Summary of all studies included Weaknesses – only reviewed by one researcher and no acknowledgement of appraisal tool used Only 4 databases searched although relevant to search. No grey literature included
Anthony, Wiencek, Bauer, Daly and Anthony (2010)	No Interruptions Please Impact of a No Interruption Zone on Medication Safety in Intensive Care Units	Quasi-experimental pilot using observational methods	Strengths – operational definitions given Trained data collector with ICU experience, known to staff Counted interruptions and recorded field notes A two tailed t test was used to analyse data, indicating whether outcomes are different from chance, either better or worse Weaknesses – unable to clarify whether the reduction in interruptions was due to the intervention or due to raising the awareness of medication safety
Colligan and Bass (2012)	Interruption handling strategies during paediatric medication administration	Interviews, simulation and observation	Strengths – data triangulated with 3 different methods Observation notes discussed with another researcher Weaknesses – abstract interviews could affect depth of data collected Simulation not always what occurs in a clinical environment

Colligan, Guerlain, Steck and Hoke (2012)	Designing for distractions: a human factors approach to decreasing interruptions at a centralised medication station	Simulation, interviews and observation, questionnaire Pre and post intervention	Strengths – naturalistic observation with observer and video Inter-rater agreement assessed using kappa statistical test Questionnaires analysed using Mann-Whitney U test Weaknesses – no detail about how participants were recruited Interviews asked for recall of a critical event, not all details may be remembered Unsure if the same respondents completed pre and post questionnaires Possible observer effect on behaviour
Dougherty, Sque and Crouch (2011)	Decision-making processes used by nurses during intravenous drug preparation and administration	Three phased ethnographic study: focus groups, observation and interviews	Strengths – focus groups used to define operational definitions Interviews used think aloud framework and occurred within 10 minutes of observation being completed Coding checked by second reviewer Weaknesses – interviews lasted only between 15 and 30 minutes
Fore, Sculli, Albee and Neily (2013)	Improving patient safety using the sterile cockpit principle during medication administration: a collaborative, unit-based project	Pre and post intervention observation study	Strengths – pre and post data collection Weaknesses – the tool was a self-reporting tool, data may have been missed as to self-report it would have to be completed retrospectively and interruptions may have been forgotten

Grundgeiger, Sanderson, MacDougall and Venkatesh (2010)	Interruption Management in the Intensive Care Unit: Predicting Resumption Times and Assessing Distributed Support	Experiment in clinical setting	Strengths – participants were blinded to hypothesis Data collected in real, clinical time No observer effect as glasses record activity Weaknesses – wearing of glasses by participants who do not normally wear them may have affected the data
Jennings, Sandelowski and Mark (2011)	The Nurse's Medication Day	Ethnographic study	Strengths – longitudinal study over 20 months Included observations, interviews, hospital policies and data Weaknesses – data was collected from 2 units that may reduce generalisability No discussion about observer training or inter-rater reliability
Keers, Williams, Cooke and Ashcroft (2013)	Causes of Medication Administration Errors in Hospitals: a Systematic Review of Quantitative and Qualitative Evidence	Systematic review	Strengths – 9 databases searched Good search strategy Weaknesses – 18-year timeframe searched which may result in the inclusion of studies when practice was very different to current standards. Only one reviewer involved
Li, Magrabi and Coiera (2012)	A systematic review on the psychological literature on interruption and its patient safety implications	Systematic review	Strengths – reviewed by 2 authors Weaknesses – limited discussion of search strategy No discussion about appraisal tool
Murphy and While (2012)	Medication Administration Practices among Children's Nurses: A Survey	Non-experimental survey	Strengths – published survey design used Face validity assessed Pilot study conducted Mix of open and closed questions Weaknesses – 42% response rate (n59) small sample

			Statistical analysis revealed no significance in tests run
Raban and Westbrook (2013)	Are interventions to reduce interruptions and errors during medication administration effective?: a systematic review	Systematic review	Strengths – clear search strategy, inclusion/exclusion criteria and data extraction criteria Weaknesses – no discussion concerning a second reviewer or use of validated tool
Relihan, O'Brien, O'Hara and Silke (2010)	The impact of a set of interventions to reduce interruptions and distractions to nurses during medication administration	Pre and post intervention observational study	Strengths – considered the rate of interruptions rather than the number Definition of interruption Single observer Use of poisson regression to analyse count data Weakness – unable to assess interrater reliability No control group
Sasangohar, Donmez, Easty and Trbovich (2015)	The Relationship between Interruptions Content and Interrupted Task Severity in Intensive Care Nursing: An Observational Study	Observational study	Strengths – trained observers Pilot study performed Inter-rater reliability assessed Weaknesses – observer in side room - risk of Hawthorne effect Daytime observations only
Sears, O'Brien-Pallas, Stevens and Murphy (2013)	The Relationship Between the Nursing Work Environment and the Occurrence of Reported Paediatric Medication Administration Errors: A Pan Canadian Study	Prospective, descriptive study Questionnaire	Strengths – face, content and construct validity appraised Researchers visited to explain how use tool Large sample Multiple regression used in analysis Weaknesses – no background data collected regarding who reported so could not analyse culture and may cause over generalisation of results
Sitterding, Ebright, Broome and Patterson (2014)	Situation Awareness and Interruption Handling During Medication Administration	Cross sectional, qualitative descriptive design	Strengths – video lessens the effect of researcher presence and bias. Weaknesses – interviews take place up to a week later, which may affect the

		Observation via videography Semi structured interviews using cognitive task analysis and review of video	recall of thought processes and reasons for decisions made.
Verweij, Smeulers, Maaskant and Vermeulen (2014)	Quiet Please! Drug Round Tabards: Are They Effective and Accepted? A Mixed Method Study	Mixed methods study Pre and post intervention study using observation And Personal enquiry and focus groups	Strengths – trained observers used to perform observation Definition of interruption Interobserver agreement calculated Purposive sampling for focus groups ensured a mix of staff with positive and negative feelings about tabards A non-parametric test was used to analyse data due to a skewed distribution Weaknesses – unable to determine whether fall in MAE was due to intervention
Westbrook, Woods, Dunsmuir and O'Day (2010)	Association of Interruptions with an Increased Risk and Severity of Medication Administration Errors	Observational study	Strengths – large sample of nurses Large sample of observations Tool was piloted Trained observers with high kappa scores 30 hours of practice observation Logistic regression analysis Weaknesses – possible Hawthorne effect

Appendix 3

Research Protocol

UNDERSTANDING THE DECISIONS MADE BY PAEDIATRIC CRITICAL CARE NURSES WHEN INTERRUPTED DURING MEDICATION ADMINISTRATION: AN EXPLORATORY STUDY

RESEARCH PROTOCOL

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Rationale

In the UK the economic burden of preventable harm from medicines is estimated to be in excess of £1 billion per annum (Frontier Economics, 2014). In addition to fiscal cost, high profile reports indicate that medication errors have a demonstrable negative impact on quality of care, patient experience, outcomes and safety (The Francis Report, 2013, Patients First and Foremost, 2013, and The NHS Outcomes Framework, 2015/16).

It is reported that children are three times more likely to be involved in medication errors (Murphy and While, 2012 and Kaushal et al, 2001). Bower, Jackson and Manning (2015) highlight that within the Paediatric Critical Care (PCC) setting ensuring the safe administration of medication is challenging due to nuances of the clinical environment and patient group. Specific challenges in critical care include bedside administration, large variations in drug dosing and volumes, complex calculations, frequent titrations and narrow therapeutic ranges (Dickinson et al, 2012). Nurses are reported to be pivotal in the medication administration process (Murphy and While, 2012), with evidence suggesting that interruptions and distractions are key causes for errors (MCGillis Hall et al, 2010). Studies that have implemented handling strategies for interruptions have identified that they are either short lived or detrimental to communication (Anthony et al, 2010). However, there is a dearth of literature which examines interruptions to medication administration in PCC and the impact of these on decision making and patient safety outcomes.

A local pilot observational study conducted in 2014 highlighted that within the paediatric critical care environment interruptions to medication administration are frequent (Bower, 2015). However, this study identified that not all interruptions had a negative outcome for the patient and important clinical decisions were taken utilising several different handling strategies. This indicates that there is scope to further investigate the impact that interruptions have on clinical decision making during medication administration.

PROJECT TITLE: UNDERSTANDING DECISION MAKING WHEN INTERRUPTIONS OCCUR DURING MEDICATION ADMINISTRATION WITHIN PAEDIATRIC CRITICAL CARE: AN EXPLORATORY STUDY

PROJECT AIM: To critically explore and understand nurse decision making when interruptions occur during medication administration in the paediatric critical care environment.

PROJECT OBJECTIVES:

- To explore medication administration in practice, recording context, interruptions and actions observed.
- Using a semi-structured interview, critically analyse ‘real life situations’, to gain greater insight into the decisions made with reference to influencing factors and perceptions of efficacy.

ETHICAL REVIEW:

Ethical approval will be sought from both Coventry University.

Ethical review includes the research design, benefits and risks to participants, informed consent, participant information leaflets and storage of sensitive data.

Local permissions will be obtained from the Research and Innovation Department and the medical and nursing Heads of Service before commencement of the study.

PROJECT DESIGN:

The project will use exploratory qualitative methods within the critical realism paradigm. The methods to be used are non-participant observation and semi-structured interviews, allowing the researcher both to witness human behaviour as it occurs, and gain in-depth understanding of actions taken. The researcher will be a non-participant observer and record interruptions as they occur. Data collection will occur from 11th January 2015 – 21th March 2015.

Stage 1: Sample

Staff:

A convenience sample will be utilised; all members of the nursing team will be invited to participate. Ideally the sample would be large enough to achieve data saturation occurs, however, the time constraints of this project may prohibit such a large sample.

Events:

The maximum time of observation is 2 hours unless a medication administration episode is occurring, in which case the observation will continue until this is complete. All medication administration will be observed and recorded during this time and in the interview the participant will be given the choice of which events they would like to discuss.

Stage 2: Recruitment and Consent

Staff:

- Written information, in the form of a participant information leaflet, will be emailed to the nursing team on PCCU and a poster will be displayed in the coffee room asking staff to read the email. This leaflet will include details regarding the observation and interview.
- Nursing participants will be offered the opportunity to ask questions before consent forms are signed.
- When the shifts are identified for the observation to occur the nursing team allocated to that shift will be asked consent as they may be involved in the second checking of medication. These information sheets and consent forms will be circulated before the shift starts, time will be allocated to answer any questions raised.
- An email will be circulated to medical, allied health professionals and support staff to inform them of the research project.

Parents:

- The nurse will be allocated their patient as usual by the nurse in charge of the previous shift. As soon as possible after the allocation has been made an information sheet will be given to the family by either the nurse in charge or bedside nurse.
- If the nurse is allocated a patient whose parents are not present or do not speak English, the date for the observation will be rearranged.
- Parents are not being asked to consent as a participant but to give permission for the researcher to be present in the child's bed space whilst observing medication administration.
- The researcher will introduce herself to the family and answer any questions they may raise. The family will be given the opportunity to consent, ask for more time to consider the request, or refuse. If more time is requested the researcher will return at a mutually convenient time.
- An entry will be written in the child's medical notes that the child has been included in an observation period with the unique identifying number. This will provide written documentation of the study.

Stage 2: Data Collection

- When the nurses have been recruited to the study the researcher will pick a date to observe them dependent on their rota of shifts.
- The nurse will then be observed for up to two hours and as soon as possible after the observation period they will be interviewed for up to 45 minutes in the quiet room on PCC. Nursing care to the patient will be administered by another nurse who has the skills to care for a critically ill child.
- The observational periods will take place within the large inpatient area. This is rectangular in shape and has four bed spaces on each side.
- The researcher will be positioned between the head end of the bed and the wall to remain unobtrusive and to allow the unit to function as normal.
- Written notes will be taken during the observation period and each administrative event will be given a unique identifying number.
- Notes will reflect the grade and experience of nurse, length of time of each episode, nature of interruption, conversations and contextual comments about activity on the unit.

Stage 3: Data analysis

Observational Data

Qualitative data will be transcribed from the notes as soon as practicable after the event and analysed through descriptive and interpretive coding which is then linked to situational analysis and relationships mapping thus identifying the essential features of interruptions in the medication administration process.

Interview Data

The interviews will be recorded and transcribed. It will be analysed through descriptive and interpretive coding which is then linked to situational analysis and relationships mapping thus identifying the essential features of interruptions in the medication administration process.

DATA STORAGE:

All data will be stored within a locked cupboard within a locked office, as per the Data Protection Act. The data will be anonymised.

GOVERNANCE ARRANGEMENTS

The project sponsor is Coventry University.

Compliance with research design though the study protocol, including ethics, collecting, managing and storage of data is the responsibility of the project team. The project team is familiar with the NHS Research Governance Framework (2005).

ETHICAL ISSUES

Method

During the interviews there is a risk that information would be shared that indicated that an error or non-adherence to policy had occurred. If an error was identified the researcher would ensure that it had been reported as per Trust policy. Policy issues would be discussed at the end of the interview, if further follow up was required, the researcher would ensure the information was shared with the nurses Team Leader. This will be highlighted in the participant information sheet.

There is a risk that the interviewee could become distressed due to issues, such as being involved in an error, being raised. If they fell unable to carry on with the interview it will be discontinued and clarification about whether initial data can be used or not. Access to senior nurse support, counselling or chaplaincy will be offered as required.

The role of the researcher

Simmons (2007) highlights four levels of participant or observer, for the purpose of this study the researcher will be a complete observer with no interaction. The researcher is unable to be a participant observer as observing interruptions and checking medications at the same time would be a risk to patient safety. Gold (1958) notes that the role of complete observer is systematic eavesdropping and that one of the problems with it is that there is no social interaction with the informants. In this study it is essential that there is no interaction with nursing staff during the administration of medication for two reasons, firstly the nurses should not be distracted from the task and secondly the researcher needs to observe the normal routine of interruptions.

Within ethnography there is a continuum between insider and outsider with regards to being an observer (Simmons, 2007). On this occasion the researcher is an insider, she is a critical care nurse observing staff within her own unit. It is essential that the researcher is aware of her own perceptions and has an awareness of these when interpreting and analysing data. Reflexivity will form an integral part of this study.

Participant Harm

If the researcher were to observe any practice that would harm the patient or the patient deteriorated requiring resuscitation she would intervene as she would within her normal role. Any elements of practice that could be improved will be addressed at a later stage by focused education sessions. The researcher required to act within the Nursing Code of Conduct both within practice and as a researcher within the clinical area (NMC, 2008)

Informed Consent

Staff – Participant Information Sheets (PIS) will be given to staff with a consent form in advance to allow them assimilate the information and provide consent without feeling pressured. All consent forms returned to the researcher will be stored in the site file.

Parents – Information leaflets will be given in advance to allow them to assimilate the information. Time will be given to answer questions and time to consider the request will be given to allow consent to be obtained without feeling pressurised.

Any child who has recently arrived on the unit and whose parents have not yet arrived will also be excluded from the study.

Children – observation will only be carried out with children who are sedated and ventilated. Their parent/family will consent on their behalf.

It could be argued that this study would benefit from covert observation; however, as Simpson (2011) notes, this is irreconcilable with informed consent.

PROJECT RISK MANAGEMENT PLAN

There are risks involved in any study and the table below highlights risks identified by the project team and the controls that are in place to minimise their effect.

Risk Area	Potential Impact	Management Approach
Patient deterioration	Child deteriorates and requires immediate life-saving treatment	Study period discontinued and researcher assists with stabilisation of patient as they would within their normal role
Drug error noted by researcher	Child at risk of being harmed by drug error	Study period discontinued and error prevented by discussion with staff involved
Poor practice observed	Minimal immediate harm to patient	Issues addressed in future through education sessions
Resistance from staff to consent to study	Limited access to data during observational periods	Involvement of staff during preparation and design of study

PUBLICATION/DISSEMINATION

In the PIS, participants will be informed that while the researcher intends to publish the findings in relevant healthcare journals and conferences, no patient or participant will be identifiable.

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Appendix 4

Data collection tool

EVALUATING INTERRUPTIONS DURING MEDICATION ADMINISTRATION ON A PAEDIATRIC CRITICAL CARE UNIT (PCCU)

OBSERVATION REPORT FORM

DATE: TIME OF OBSERVATION PERIOD:

BACKGROUND

Staff on shift:
Band 7:
Band 6:
Band 5 (with critical care qual) (code 5Q):
Band 5 (more than 6 months' critical care experience) (code 5+):
Band 5 (less than 6 months' critical care experience) (code 5-):

Number of patients:
Level 1:
Level 2:
Level 3:
Level 4:

Date:

MEDICATION ADMINSTRATION EPISODE: Start Time: End Time:

Patient Dependency:

Grade of Staff involved:

INTERRUPTIONS:

Why was the process interrupted?

• Telephone call	□	□	□	□	□
• Allied health professional	□	□	□	□	□
• Medical staff	□	□	□	□	□
• Other nurse	□	□	□	□	□
• Patient monitor	□	□	□	□	□
• Patient movement	□	□	□	□	□
• Looking for supplies	□	□	□	□	□
• Checking dose	□	□	□	□	□
• Discussion of other topics	□	□	□	□	□
• Parents	□	□	□	□	□
• Student	□	□	□	□	□
• Other	□	□	□	□	□

<u>Interruption 1</u>

Details about situation:

Was drug administration stopped?

Staff reaction:

Handling strategy:

Appendix 5

Example transcript

Interview participant Number 6

Date 28.2.16

Length 45 minutes

Interviewer: can you just confirm to me that you have consented to take part in the study Understanding the decisions made by PCC nurses when interrupted during medication administration

Participant: yes

Interviewer: and are you happy to continue with the interview?

Participant: yes

Interviewer: can you confirm for me what band you are and how many years' experience you have?

Participant: ehh I'm a band 7 and I've been qualified for 20 years and I've been on PICU for 18.

Interviewer: Thank you. Before we go through the observations individually, can you take me through the safety checks you perform on a day to day basis when you're caring for a patient on PCC.

Participant: general safety checks or medicine related checks?

Interviewer: both

Participant: so general safety checks will be, is first of all about checking your patient's safety so em so using the ABC approach for checking their airway, breathing and circulation em and within that checking around the bed space so checking your safety equipment, so your bagging circuit and suction equipment are functioning properly, that you've got appropriate airway stuff, so that if your ventilated patient should dislodge or remove their tube emm looking at the ventilation settings, looking at the alarm limits on that and the monitor, looking what your parameters are of your observations, em and checking the medications, so checking your drug card is for the correct patient, looking at what drugs are prescribed, looking at what times they are prescribed and making sure from handover the drugs have been given when they should of, and then checking the infusions against the prescription chart. With the previous em, nurse, before em they go home. As part of accountability handover. Emm….. I think that's it,

Interviewer: ok, and do you think any of these have any influence over your medication administration practice at all?

Participant: ehhh well looking at, so I think yes, yes because, by looking at your charts and your infusion charts, emmm, makes you plan, and it makes you become aware of when your infusions are going to expire or run out, which obviously they should never do either, emm especially if your patient is on inotropes like our patient was, you need to be extremely careful with inotropes, em and I think it sets your mind-set knowing, it plans, it plans your drugs into your work, it makes you very quickly aware of when your drugs are going to be due and then also what equipment or what staff are going to be needed to fulfil those tasks really.

Interviewer: ok, em which are the most important and why of those safety checks?

Participant: I think there all as equally important because you've got to have patient safety in case something occurs with your patient, you've got to have the equipment around the bed space to be

able to deal with your patient, emm and checking your medicines, but equally the drugs that are infusing and the checking of the drug card em, are I would argue are equally as important because you've got to make sure the right patient is getting the right drug. Em if you didn't check your card it could be that there had been a prescription error and a child was getting too little or too much of a drug which obviously is dangerous and like I said with inotropes you have to make sure that's right for your patient because you, and make sure they never run out because that could be detrimental. Emm and I think the IV infusions emmm, that may be is first thing that I check and make sure is right because that's going intravenously, obviously what is prescribed on the drug card is equally as important but emm if a dose say of furosemide on the drug card has is slightly late then I'd but there was a problem with the infusions then I'd address the infusions before that, so I'm not saying the drugs on the drug card aren't equally as important but maybe priority of importance sort of the sedation of a ventilated child and inotropes are more highly important to me than a stat dose of something maybe on the drug card.

Interviewer: and when you, can you just talk me through what you check on a drug chart at the beginning of the shift or during those safety checks?

Participant: so on the drug card itself I make sure that em it was the corr, so it had got the label on now we that we have to scan, so it got the so it was the correct patients details on the chart so I'd check the name, the date of birth and the hospital number, again if it's hand written I'd put a label on it and check it was the label, the weight of the patient, and whether they had any allergies, I'd look on the front as well so see if he's on any normal medications emm and obviously I'd check that my patient had a name bracelet on, em to check the details against that so that you know it's for the right patient and then with each individual drug em check the dose of the drug before giving it which we did with the BNF quite a few times.

Interviewer: do you do that as one whole thing or do you do it as you come to administer the drugs (which was observed)?

Participant: so I would check the drug card itself, at sort of handover, that it was the right patient and all the weight and stuff on it and then I'd open it and I'd look at each individual drug and see when the drugs are due and then I'd check the drug dose before I administered it, at the point of administering it but when we did, there was an episode when we did 3 infusions all together at one go, so I like to, or if I'm doing multiple drugs I like to do that as like one thing before I'll glove up and that because then my mind set's on checking all the drug doses of those drugs that are due rather that drawing one up then looking in the BNF again then drawing another one up, I like to check the doses before I start. So I like to prepare that, I'll write the labels before I then start drawing up the drugs.

Interviewer: how did you feel about your drug administration today generally? How did you feel during the different episodes that we've watched?

Participant: so today, emm it's been, it's been absolutely fine, I felt like because the environment, it all, I think it has a great influence on what role you have in your shift and the environment, so today was a weekend day, I wasn't the nurse in charge I was the bedside nurse, it was relatively quiet as in noise wise on the unit, so I felt that it was a safe environment to do the drugs today, but that can vary, can differ greatly between days and circumstances so I felt em, yeah, I felt it was a good environment today to be checking drugs at the bedside.

Interviewer: so during the first episode you were drawing up a potassium correction?

Participant: that's right.

Interviewer: how did you feel about that drug?

Participant: em I em I I'm familiar with drawing up potassium correction so em, I know the dose for a potassium correction I em and I'm happy, very happy to administrate that, however, I was very aware that the nurse I was checking it with was very junior so I made sure she was happy and knew where the policy was to check the dose and administer it.

Interviewer: did you feel you were interrupted during the administration?

Participant: emm was it during that one that the pump alarmed? Or did the physio come? I can't remember, emmm……. I don't think I was during that one, there was one episode where the physio started to come. I wasn't interrupted enough to be aware …… that I needed to ignore that interruption to be able to concentrate to carry on if that makes sense?

Interviewer: during that drug administration, while you were preparing it you turned round to put your sharps in the sharps bin and it wasn't there.

Participant: yes

Interviewer: how did that make you feel when you saw it was missing?

Participant: I was surprised, because I checked I had my trolley and got everything ready, did my preparation for administrating the drug, and the sharps bin was there and I actually didn't see the person take it off, whether that's because I was concentrating on what I was doing or looking at checking the drug, so I was actually surprised to see it had gone because I had no clue that it had gone. Em so when I turned to literally put the needle in the sharps bin it had gone. Em however, there is a sharps bin in the bed side just next to it so I em it wasn't a great issue I just had to use that one.

Interviewer: did that have any effect on how you were working your way through the process?

Participant: I guess for a split second it distracts your mind into thinking where is it? Rather than 100% concentrating on what you are doing but I'll say it was a momentarily em distraction because another sharps bin was right by the side, it wasn't a problem that I had to go and get a sharps bin o leave my sharps in an unsafe place.

Interviewer: as you were totally unaware was there anything that could have prevented that?

Participant: emm I guess to prevent it we could educate people not to take sharps bins off trolleys when people are doing drugs on those trolleys.

Interviewer: when you came to attach the correction to the lumen I was watching and saw that you were talking through what was running through all the lumens. Can you explain why you were doing that?

Participant: I think it's because the patient we were looking after at the time had a triple lumen central line and had a lot of infusions infusing on those lines. There was a line with inotropes on, there was a line with morphine, midazolam and rocuronium on, a line with furosemide on, with a saline flush and a then a spare port on that line. So there was a lot of connections on the three lines, so it was a safety thing really, to make sure I was putting the potassium on the correct port of the correct lumen emm and often I will speak out loud about things like that so that whoever's checking it with me it's like a confirmed talked through process. Because often we put potassium infusions on

a single line, we don't often put them something else running, so to put potassium with furosemide we know that its compatible, we can do it, but as there was a spare port on the inotrope line, which clearly we'd never put anything with inotropes so it was just em part of a safety check.

Interviewer: then just as you were programming the pump to deliver that potassium, the physio came to the end of the bed space and asked if she could treat your child, as she asked that I was aware of you saying errr….. what was happening then do you think?

Participant: so I was aware that I was in the process of programming the pump and she'd asked me a question, however, I knew I was nearly at the very end of administrating the drug so for the sake of 10 seconds I would be finished and I would be able to address what she was saying but I didn't want it, it's a little bit difficult cause I didn't want her to think I hadn't heard what she was saying at all or ignoring her em and obviously she should have realised we were doing drugs but again it's that em it's that education of somebody else realising that you're doing drugs and not interrupting you when you are doing them. So I guess it's a knee jerk reaction to make some sort of noise and almost make you realise you've heard them, but not speak enough to distract from programming the pump. And I knew that I was nearly at the end of the process so I would be able answer her correctly.

Interviewer: so was that a conscious thought process or just reaction to it?

Participant: I guess it's a reaction, a reaction to a voice that you've heard but you know you're not going to have a conversation of any length with them cause you're doing drugs. So yeah I guess it's a reaction rather than saying nothing it's a reaction to make a noise.

Interviewer: do you think your experience has any impact on that?

Participant: Probably yes, yes I think through experience and doing yeah lots and lots of medication you realise the importance of not getting interrupted when programming pumps and stuff and obviously as senior staff we investigate incidents where we see where the errors occur. So yeah I think through experience you are more tuned into knowing you shouldn't stop and answer. Whereas that reaction in a junior member of staff might actually go on to be a sentence or two.

Interviewer: the second episode of drugs you gave to the child was IV antibiotics and then some oral drugs. How do you prepare for that administration?

Participant: so emm …. Oral antibiotics and ……

Interviewer: it was IV antibiotics and then your orals.

Participant: so we checked the doses I think of those before we started. We got the BNF and checked them. Well the cef no the IV we didn't because we know that's 50/kg so through experience I know that's 50/kg I couldn't honestly say whether checker picked the BNF up and checked it. Emm so we did the IV drugs first which I always do, I always separate the drugs so I'd never draw up IV drugs and oral drugs up in the same session. So we did the IV drug first, em and administered that, em and again the preparation is making sure the trolley's there and the equipment you need is there and obviously you go to the drug cupboard and get your drug out and check the BNF and wash your hands and be more clean and them proceed with your administration.

Interviewer: do you think any of those preparations have any effect on any interruptions?

Participant: if you haven't got the equipment you need for delivering the drug then yes, because if you've forgotten something vital like you're making something in dextrose and you're making something in dextrose then you would have to stop to go and get your bag of dextrose out of the

cupboard so that would be a big interruption to what you are doing. Even if you sent somebody else to do it cause you were clean em it's still a break in the administration of the drug so yeah. So yeah I think preparation has a lot to do with it.

Interviewer: so whilst you were administering that IV antibiotic, a pump alarmed because the potassium infusion was low. You actually stopped administration to silence the pump, how do you decide how you are going to handle the interruption?

Participant: so if an IV pump alarms I think the natural reaction and instinct is to look, it definitely, you couldn't ignore it because if my back's to the pumps I didn't know if it was the potassium infusion that was alarming that it was low or it could have been my inotrope pump that the pressures had gone up and it had stopped I had, you had to turn round to have a look to see actually what it is em alarming and the alarm itself is distracting to what you're doing cause its loud em so I wouldn't be able to for one I couldn't ignore it cause I wasn't sure what drug it was and for two the noise is distracting of what you're doing so I think that makes you address the issue. If the checker the person who was with me, who was the second checker was behind me or closer to the pumps then they could deal with that for me, em but I don't think at that time she was. So that's why I spun round and had a look and I think I did silence it.

Interviewer: when you were checking the drug doses for the oral drugs in the second half of the episode. Em you had the BNF out and the drug keys were underneath your drug chart, I don't know whether you had any awareness or if you remember them being pulled out from beneath the drug chart.

Participant: while I was checking the doses? No I didn't really, I was concentrating on what I was doing

Interviewer: so how do you focus your concentration then, how does that work? How do you block out things?

Participant: I guess ……. It's difficult to answer but I guess you block out almost unnecessary like noise and interruptions but you wouldn't block out like a shout for help or that sort of block so .. I guess you must be aware of your environment that's around you but you must be able to channel what's important and what's not.

Interviewer: mmm

Participant: because you wouldn't ignore me shout for help but you may ignore a conversation that is taking place behind you that was irrelevant to you or what you were doing. I don't know.

Interviewer: when you were preparing, drawing up the oral potassium, there was a comment about the bottle being sticky, what prompted that and made you talk about it?

Participant: it was sticky; I don't know I it was a natural reaction to say that it was sticky. I guess I didn't have to say that, it wasn't, it had no effect on anybody or the patient em, I don't know a natural comment that came out of my mouth I guess. Emm it didn't bear any influence on what I was doing as in it didn't matter that it was sticky it was a comment that was passed. Human nature I guess.

Interviewer: and how do you refocus your concentration after you have had a reaction like that?

Participant: I think it just naturally happens I think I'm very careful with drugs and checking of them emm yeah I think it's just you focus straight back on what you were doing. I think it is a momentarily,

it almost doesn't seem a distraction because I was still doing what I was doing when I said it. It wasn't as if I stopped put everything down while I said it, it's just like it comes out your mouth whilst you're doing things. So almost like unaware that it's distracting me.

Interviewer: and then also during that preparation you were trying to aspirate with the syringe straight out of the bottle but there mustn't have been enough medicine in there so you had to stop and look for a pot. How did that affect your thought processes?

Participant: em I guess again I would say it momentarily distracts you because you're looking for a pot in the trolley emmm … yeah you look for a pot so it does distract you, it does distract you momentarily of what you're doing, emm your second checker they could have realised that's what I needed and got one out without any speech but they may not have realised what I needed. I guess the way to get round that is to emm always have a pot out in case you can't get the drug out the bottle. In an ideal world. I could have tipped it a bit more but I might have spilt it.

Interviewer: and then you were struggling to find the pH strips, did that have any influence on the process?

Participant: again that was a distraction so em before as part of the preparation of drawing up those NG drugs instead of presuming they were there because we'd just aspirated the NG tube I should have made sure they were there on the right next to me at the bed side or on the trolley I was checking the drugs on, again part of preparation and getting all your equipment ready. So yeah, I looked in the drawers, they weren't actually in the drawers where they were, emm again that could have been something I wasn't aware of I could have presumed they were there because we had just used them, and unaware that someone had come and taken them out of our bed space but yeah, part of preparation. I should have made sure they were there and out on the trolley to hand.

Interviewer: and did it make any difference where you were in the process of discovering they were missing?

Participant: I guess naturally it was going to occur when the drug had been checked and drawn up because it's at the point I actually wanted to administer the drug that I went to look for them, so the safety of checking the dose and actually drawing the drug up, had been done. Emm and I wouldn't have naturally looked for them any earlier really, had, no I wouldn't of.

Interviewer: and the final episode was the preparation of sedation, so morphine, midazolam and then the muscle relaxant rocuronium. How did you feel during that administration episode?

Participant: so I felt quite comfortable with it because I'm used to doing it again I was aware that it was a much more junior member of staff that I was checking the infusions with. And may, that member of staff may not have actually checked lots of emm infusions like that in the past. Emmm and there was a lot to do in one go because all three infusions needed changing in the same go, so I think with that you know you're going to be busy for quite a long period of time. And obviously because you are preparing 3 at one time you have to be very careful and methodical how you are preparing them, how you are labelling them, so that no error occurs and you don't mix them up. However, the environment was good to do it at the bedside on this said day. Because again it was relatively quiet, I wasn't the nurse in charge I was the bedside nurse, emm I don't think the parents, mum wasn't there at that time so the bed space was quite quiet so it felt, em it felt the right environment to be doing it in, so interruptions I guess would be minimised.

Interviewer: did you feel like interruptions occurred?

Participant: emm I was aware in my head that the ward round had started and that they were, they'd edged towards, they were at the patient before my patient so subconsciously in my head I hoped that I'd got the infusions complete before the ward round had got to me cause obviously that would have been a distraction so subconsciously I was aware of that but I wasn't aware, I wasn't aware of any other distractions around me, or in my bed space at that time.

Interviewer: so whilst you were writing the labels, mum was there at the start, but while you were writing the labels for the infusions and you sort of stopped half way through to speak to her, I hadn't notice her ask a question but what made you stop and speak to her about the doctors?

Participant: ok, so the mum had been anxious and I was aware she was there at the point I was doing this, so again as part of preparation if the other nurse is not quite ready to check the infusions I like to start because it was a job that needed doing so I was writing the labels out, we'd already checked the infusions were right with the patient's weight at the start of our shift, I didn't way that previously but we'd checked the pump programmes and were happy it was the right drug and the right dose is going through and the pump is programmed properly, so we'd already checked all that so I was purely writing out the new labels for the new syringes em which I knew I would check again with my second nurse when she returned, em before we'd put that label on the syringe so I felt it was a safe and appropriate time to pause what I was doing to be able to support that parent and to update her with regard to what was going on.

Interviewer: why did you when you'd finished writing your labels, you went off to find another blue tray, to prepare your drugs on, was there a reason?

Participant: I went to get another blue tray because all the CD's out of the cupboard had been carried out on the blue tray that I'd previously been using and I guess in my head I was still preparing although I guess the administration, the medication process probably started when I was writing those labels. It didn't feel like it had properly started so I was still in that preparation, I was like in the preparation process so part of the preparing had been to write the labels, to check the drugs, to get the drugs out and the equipment out. Emm so I didn't feel walking away at that point to get a blue tray was distracting me from thinking about what I was doing with the medication. And I needed that tray to carry out the task I couldn't have done it without a blue tray.

Interviewer: and while you're away do you continue to think about medication while you are getting that tray?

Participant: emm I'm aware that I'm going to, I guess I'm not constantly going over in my head what drugs I'm going to do and stuff because they're familiar to me. Emm but obviously I know that I'm going to be doing drugs cause I'm going to get a blue tray that I need to be able to do the drugs on. So that I know that I'm in the preparation phase of doing the drugs I guess

Interviewer: and also during that time as well a pump alarmed for a flush and again you silenced it and switched it off. Is that for the same reasons as before?

Participant: yeah I mean I think that time I was probably more aware that it would be the flush but again I couldn't ignore a pump alarming for the same reasons cause you just don't know what it is. Emm and the noise is distracting and because we were doing a lot of drugs emm it would have been too distracting to leave that alarming again. The second nurse, that is something the second nurse could have however, in that process of doing all those drugs the second checker nurse was very involved checking things as we were swapping them over one by one anyway because you have to be careful what you are taking off is what you are putting back on, she was also putting the syringes

in the pumps and concentrating that she was putting the right drug in the right pump but yeah arguably she could have silenced that and turned it off for me which would have distracted me less from the point of what I was doing.

Interviewer: so when you had that break that break between your preparation and the start of making the drugs, how do you refocus, what goes through your mind when you are starting up again with the task?

Participant: I think I just naturally go back into and just think right ok, I just go back into it almost like automatic pilot, I know what point I was at and I can see that by literally what I was doing emm I just continue on, I don't feel distracted, I don't keep thinking about the pump alarming or what I've just done to the pump I focus straight back on the task and I think that by focusing on what you're doing blocking out the other external stuff and like just regrouping yourself and getting on with, with what the process in hand and whether that comes through experience, channelling straight back on it probably does emm, I can yes, I can get my mind straight back on what I was doing.

Interviewer: whilst you were drawing up the dextrose for the morphine infusion you glanced over at your patient, can you remember why?

Participant: I think just drawing up, when you are just drawing up your dextrose in your syringe I guess you've almost got a second to like, have a thought about things and because he's a ventilated patient, I do like to eyeball the observations to make sure although the alarm limits are set on the monitor I do often, I do glance at the monitor to check, to see what the numbers are doing for that split second when I'm drawing up the dextrose. Almost like multitasking, I don't feel it's a distraction it's a normal sort of like a natural thing to do. When you 've got a pause, not a pause in what you're doing cause you are doing your drugs but it's an opportunity to have a quick glance at a monitor without distracting what I'm doing.

Interviewer: and what information do you take in?

Participant: so from quickly glancing at the monitor em it depends, obviously from a quick glance you wouldn't be able to memorise every set of observations but he', because he's on inotropes he'd had issues with his blood pressure so I was quickly glancing to see what that was and to make sure his saturations were ok.

Interviewer: you were questioned by the checker as to how long morphine is stable for? Did this distract you at all?

Participant: not really, it didn't distract me and it's probably part of the checking process. She was wanting a confirmation of what she thought was right so I guess it's part of, it's part of the safety checking of the drugs that she's asked a question she wasn't sure of, and it was a very simple questions with a very simple answer. And it was relevant to what we were doing.

Interviewer: can you remember how you dealt with it?

Participant: I think I carried on what I was doing and answered it.

Interviewer: is that a usual method of dealing with it?

Participant: it depends what, it depends what's been asked of you, if it's something like that a simple question with a simple answer, had it been more complex and it meant for example having to show her in the pharmacopeia a drug dose or checking like that then, then that would have been more distracting and I wouldn't, I wouldn't have stopped and had the same conversation with her.

Then I would have carried on what I was doing and at an appropriate time when I could safely put the drug down in the tray and pause and we'd sort that out and do it then. So it depends what the question was I think, it's relevant I think it's relevant dialogue to what you're doing so it was all to do with the drugs that we were using and it was safety and its right for her to question if she's unsure about something we're doing em but I'd say it's very much depending on what that question was as to how full you give the answer if she'd have asked me a more detailed question I might have just said hang on a second we'll discuss it in a minute so that I could concentrate on just doing what I was doing so that an error didn't occur.

Interviewer: and then the midazolam label box was empty.

Participant: yeah part of checking, preparing, presuming that because there was a box in there it had labels in it, but quite clearly it was empty when I got it out so yes, so we could of, we could have carried on and put that syringe, I mean the syringe had the label on it of the handwritten, handwritten label so we knew it was midazolam, so we could, we could of carried on and got the orange labels at the end. I didn't ask her to go and get some, she said oh, I'll go and get some and she went and got some so arguably it's more safe if it's labelled with the orange stickers at the time em distracting yes, part of preparation, maybe she could have got the stickers out of the top draw of the trolley before I started but I presumed because there was a box, that it was empty, full sorry. And it wasn't so, yeah a distraction to what we were doing, again I don't think enough to distract me from what I was doing because it was a safe point almost, cause I'd drawn the drug up in the syringe the label was on the drug, it was almost a natural pause in what we were doing. She went and got the labels we put them on and moved on to the next drug.

Interviewer: and during the preparation of the midazolam the pump alarmed for a continuous saline flush, that seemed to be a bit of a surprise?

Participant: I was, it was I wasn't, I hadn't planned to make up another saline flush at that time and I hadn't realised it was going to run out whilst we were doing our else I may have done that one first and put that one up so there was no distraction of an alarm before we started but I hadn't realised it was going to alarm to be honest.

Interviewer: you then actually stopped the drug preparation between the midazolam and the roc to prepare that saline, why did you choose to do that?

Participant: so I was going to, so my first train of thought was because it had alarmed, the reason it was running, it was running along the furosemide because the furosemide was running at such a small amount of mls/hr, it was running aside that to keep the line patent and my first thought was to make a new one up and get it going so the line didn't bleed back or there wasn't any issue with the line so for line patency em and whilst I was clean I could do that so I started to do that surely what we did, we drew up because it was a very quick thing to draw up, we drew up 20mls of saline, however, then as I was drawing it up I changed my mind set because I realised that the only infusion I had left was rocuronium that we'd already checked and again is a very quick infusion to em draw up so I decided at that point to draw the rocuronium up so that I wasn't completely distracted and having to walk around to the other side of the bed space to put the saline flush on and also em making myself almost dirty by touching the pumps and the patient and all that sort of stuff, it would have been a longer break em to getting back to the task so I decided em literally the sake of a minute that it would have taken me to draw up the rocuronium I would carry on and then take the whole drug tray around to the other side of the bed space and em change the saline first as part of the change of the whole set of infusions.

Interviewer: after I think, while you were drawing up the rocuronium, you did glance over at the ward round, can you remember why?

Participant: I think I was aware that em like I said before they were at the patient before mine so I was aware they were getting close to coming to me and I was in the middle of doing drugs and I didn't want them to come to the bed space while I was in the process of changing infusions over so I think it was a subconscious where are they? Sort of a look.

Interviewer: and then a pump alarmed again for the saline but I wasn't convinced you had noticed it?

Participant: I think I knew, I think I knew what that was alarming so and I knew I'd drawn one up so I don't think I silenced it that time did I?

Interviewer: no the checker went

Participant: to silence it, so I knew because I'd put it on hold I think I was confident that time that I knew what that was that was alarming so I continued so that I could get the drugs done so that I could swap it over.

Interviewer: and whilst you were attaching the infusions the cardiac test bleep went off. What went through your head then cause you did take notice.

Participant: so like we said before about knowing what's important distractions and what's not that bleep is something when it does go off you don't ignore it so that, it's very loud and it's a distinguished thing so your ears and your attention is automatically pulled to what that bleep is saying, at the same time I was listening to the bleep going on I looked at the clock to see if it was the time, around about the time that when they do the test calls. And it was, but as the senior person on the shift em you're tuned into listening for that bleep. So I wanted to listen to that bleep to make sure it wasn't an arrest call that had gone off.

Interviewer: did that affect what you were doing at the time?

Participant: it paused me from what I was doing because I didn't carry on what I was doing and listen at the same time I stopped what I was doing momentarily to listen so that I could concentrate to be fair on what the bleep was saying. Which I'd rather do, rather than trying to do two jobs at once cause that's not safe and it isn't and yeah it's important and that bleep going off is a big distraction because it doesn't always go off, it doesn't go off once it often goes off 3 or 4 times and it's really loud. And it's something you know you can't ignore so it is a distraction but a distraction that you can't ignore.

Interviewer: mm

Participant: if that makes sense?

Interviewer: and just as you were finishing off the receptionist appeared at the end of the bed with some paperwork.

Participant: if I did know she was there it wasn't a big distraction because I don't actually remember her being there to be fair. Did she speak to me?

Interviewer: she spoke to your checker

Participant: ok, it didn't distract me, I wasn't really aware she was there.

Interviewer: so now that we've gone through the distractions and interruptions, looking back would there have been anything you would have done differently?

Participant: so I guess it highlights the importance of preparations that you don't have to look for anything during the process, so maybe thinking the whole process through a little bit better and making sure like you've got labels in your boxes and not presuming that just cause the box is in there it's got stickers in it. Em so I think lessons can be learned about preparation definitely making sure absolutely everything is there. Like I said today the environment was quite conducive cause it was relatively quiet round our bed space emm so the environment today was quite, quite good. I am aware the environment can be very distracting just from general noise and the physical amount of people and stuff here. Em I guess it makes you more aware of what is a distraction when you're doing your administration and again I think probably through experience you know to channel the stuff out that isn't relevant and can wait and doesn't need to be dealt with immediately however, again may be through experience your ears prick up when you hear the arrest bleep go off and you can never, you know that's something you need to listen to so although it's a distraction it's a necessary distraction to you. So yeah I think em I think because I've been here a long time and you do a lot of drugs on a daily basis you don't step back and have a really close look at what you do. Or question what you do, so much, so by this, yes definitely lessons to be learnt, probably more around preparation, not so much around the safety of the drug, the equipment probably more so, em because I think I'm quite methodical in checking drug doses and all that sort of stuff before we start actually physically drawing up the drugs. Em may be just checking the draws a bit more thoroughly you know getting the pH strips out, which I probably have never done it the past, but perhaps I need to change my practice and make sure everything is laid out in front of me before I start.

Interviewer: and just to finish is there anything you want to add that we've not talked about?

Participant: em only to say that I think it very much depends so not very much depends, but it can depend on the role you're allocated on the day, so for example I feel that if you're the nurse in charge on a busy shift, em and you are the second checker I think you get a lot more interruptions because you are the nurse in charge, you are the nurse that everybody comes to. I think education of other people, people don't stop and think oh you're doing drugs I'd best not talk to you, they see you as the nurse in charge and come and disrupt you with anything, no matter how important or not. So I think, I think it is role dependent a little bit too. All that can have a strong influence on the amount of interruptions em to medication. And the environment, even from like a weekday, like a Monday morning weekday to may be a weekend day because it tends to be a little bit quieter on the nights and at the weekends and just like the whole, like today the environmental noise was low, there wasn't lots of people around, it was a good environment, in the week the actual environment the noise, the environment can be really distracting because naturally it's just loud and you have to work harder to channel yourself into what you're doing. I think through experience you can, I don't know it would be very interesting with the junior members of staff to find how distracting that is to them, cause I would imagine probably a lot more because they're not so used to the environment.

Interviewer: thank you.

Appendix 6

Example coded transcript and definitions

Data	Master Code	Sub Codes
Interviewer: Thank you. Before we go through the observations individually, can you take me through the safety checks you perform on a day to day basis when you're caring for a patient on PCC. Participant: general safety checks or medicine related checks? Interviewer: both		
Participant: so general safety checks will be, is first of all about checking your patient's safety (Int 3 line 17)	• Checking the patient's general safety	• PSC
so em so using the ABC approach for checking their airway, breathing and circulation em and within that checking around the bed space so checking your safety equipment, so your bagging circuit and suction equipment are functioning properly, that you've got appropriate airway stuff, so that if your ventilated patient should dislodge or remove their tube emm (Int 3 line 18-21)	• ABC check • Safety equipment available and working • Planning for unexpected events which could compromise safety	• PSC • PSC • PaP
looking at the ventilation settings, looking at the alarm limits on that and the monitor, looking what your parameters are of your observations, em and (Int 3 line 21-23)	• Checking alarm limits	• PSC
checking the medications, so checking your drug card is for the correct patient, looking at what drugs are prescribed, looking at what times they are prescribed and making sure from handover the drugs have been given when they should of, and then checking the infusions against the prescription chart. With the previous em,	• Being aware of observation parameters • Checking drug chart is for right patient • Assessing drug chart for times medication is due and when they were last given • Checking infusions against prescription	• PSC • MM + PSC • MM • MM + PSC

nurse, before em they go home. As part of accountability handover. Emm….. I think that's it, (Int 3 line 23-27)	• Checked with nurse from previous shift (accountability handover)	• MM
Interviewer: ok, and do you think any of these have any influence over your medication administration practice at all? Participant: ehhh well looking at, so I think yes, yes because, by looking at your charts and your infusion charts, emmm, makes you plan, and it makes you become aware of when your infusions are going to expire or run out, which obviously they should never do either, emm especially if your patient is on inotropes like our patient was, you need to be extremely careful with inotropes, em and I think it sets your mind-set knowing, it plans, it plans your drugs into your work, it makes you very quickly aware of when your drugs are going to be due and then also what equipment or what staff are going to be needed to fulfil those tasks really. (Int 3 line 30-36)	• Assessment of drug and fluid chart makes the nurse plan • Awareness of expiry or empty syringe • Infusions should never expire or run out • Inotropes need extra care • Informs mind set • Plans medication into work plan • Very quickly aware of administration times • Helps to ensure equipment and staff are available.	• MM + PaP • MM + PaP • MM • Drug complexity (DrC) • PaP • PaP • PaP • PaP
Interviewer: ok, em which are the most important and why of those safety checks? Participant: I think there all as equally important because you've got to have patient safety in case something occurs with your patient, you've got to have the equipment around the bed space to be able to deal with your patient, emm (Int 3 line 38-40) and checking your medicines, but equally the drugs that are infusing and the checking of the drug card em, are I would argue are equally as important because you've got to make sure the right patient is getting the right drug.	• All safety checks have equal importance • Got to maintain patient safety • Need to be ready to deal with unexpected situations • Checking medicines is important • Need to make sure the right patient is getting the right drug	• PSC • PSC + MOP • PaP + IOC • MM • MM + PSC

Em if you didn't check your card it could be that there had been a prescription error and a child was getting too little or too much of a drug which obviously is dangerous and like I said with inotropes you have to make sure that's right for your patient because you, and make sure they never run out because that could be detrimental. (int 3 line 40-45) Emm and I think the IV infusions emmm, that may be is first thing that I check and make sure is right because that's going intravenously, obviously what is prescribed on the drug card is equally as important but emm if a dose say of furosemide on the drug card has is slightly late then I'd but there was a problem with the infusions then I'd address the infusions before that, so I'm not saying the drugs on the drug card aren't equally as important but maybe priority of importance sort of the sedation of a ventilated child and inotropes are more highly important to me than a stat dose of something maybe on the drug card. (Int 3 line 45-52)	• Checking can prevent ongoing errors • Errors can be dangerous • Inotropes have to be correct and never run out • IV infusions are first thing to check as running intravenously • Checking intermittent doses is equally important but infusions are a priority or importance	• MM • Impact of errors (IoE) • DrC • PSC + MM • PSC + MM
Interviewer: and when you, can you just talk me through what you check on a drug chart at the beginning of the shift or during those safety checks? Participant: so on the drug card itself I make sure that em it was the corr, so it had got the label on now we that we have to scan, so it got the so it was the correct patients details on the chart so I'd check the name, the date of birth and the hospital number, again if it's hand written I'd put a label on it and check it was the label, the weight of the patient, and whether they had any allergies, I'd look on the front as well so see if he's on any	• Drug chart check involves ensuring correct label (check name, DOB, and hosp number) • If handwritten would change to printed label • Check for allergies	• MM + PSC • MM • PSC

normal medications emm and obviously I'd check that my patient had a name bracelet on, em to check the details against that so that you know it's for the right patient and then with each individual drug em check the dose of the drug before giving it which we did with the BNF quite a few times. (Int 3 line 55-62) Interviewer: do you do that as one whole thing or do you do it as you come to administer the drugs (which was observed)? Participant: so I would check the drug card itself, at sort of handover, that it was the right patient and all the weight and stuff on it and then I'd open it and I'd look at each individual drug and see when the drugs are due and then I'd check the drug dose before I administered it, at the point of administering it but when we did, (Int 3 line 65-68) there was an episode when we did 3 infusions all together at one go, so I like to, or if I'm doing multiple drugs I like to do that as like one thing before I'll glove up and that because then my mind set's on checking all the drug doses of those drugs that are due rather that drawing one up then looking in the BNF again then drawing another one up, I like to check the doses before I start. So I like to prepare that, I'll write the labels before I then start drawing up the drugs. (Int 3 line 68-73)	• Check medication history • Check for name band • Check each dose using BNF • At handover checks patient details, weight and sees when drugs are due • Doses are checked at times of administration • Event where 3 infusions changed in 1 episode • When checking multiple drugs or infusions checks all doses before starting drawing up process • Mind is focused on checking doses • Prepares by checking doses and writing labels	• PSC • PSC • MM • PaP + PSC • MM • DrC • MM + DrC • FLC • PaP
Interviewer: how did you feel about your drug administration today generally? How did you feel during the different episodes that we've watched?		

Participant: so today, emm it's been, it's been absolutely fine, I felt like because the environment, it all, I think it has a great influence on what role you have in your shift and the environment, (Int 3 line 76-77) so today was a weekend day, I wasn't the nurse in charge I was the bedside nurse, it was relatively quiet as in noise wise on the unit, so I felt that it was a safe environment to do the drugs today, but that can vary, can differ greatly between days and circumstances so I felt em, yeah, I felt it was a good environment today to be checking drugs at the bedside. (Int 3 line 77-81)	• Environment and role have influence over how shift feels • Being bedside nurse rather than nurse in charge made it safer • Quiet unit made it safer • A good day to check medication at bedside	• IOR + influence of environment (InOE) • IOR • InOE • InOE
Interviewer: so during the first episode you were drawing up a potassium correction? Participant: that's right. Interviewer: how did you feel about that drug? Participant: em I em I I'm familiar with drawing up potassium correction so em, I know the dose for a potassium correction I em and I'm happy, very happy to administrate that, however, I was very aware that the nurse I was checking it with was very junior so I made sure she was happy and knew where the policy was to check the dose and administer it. (Int 3 line 85-88)	• Familiarity with drug • Know the dose • Checking with junior nurse – responsible for ensuring they know policy for administration	• Impact of experience (IoEx) • IoEx • IoEx + TVA
Interviewer: did you feel you were interrupted during the administration? Participant: emm was it during that one that the pump alarmed? Or did the physio come? I can't remember, emmm……. I don't think I was during that one, there was	• Lack of awareness of being interrupted	• DTI

one episode where the physio started to come. I wasn't interrupted enough to be aware …… that I needed to ignore that interruption to be able to concentrate to carry on if that makes sense? (Int 3 line 90-93)	• Wasn't interrupted enough to be aware • Interruptions had not broken through concentration or focus	• DTI • IOI
Interviewer: during that drug administration, while you were preparing it you turned round to put your sharps in the sharps bin and it wasn't there. Participant: yes Interviewer: how did that make you feel when you saw it was missing? Participant: I was surprised, because I checked I had my trolley and got everything ready, did my preparation for administrating the drug, and the sharps bin was there and I actually didn't see the person take it off, whether that's because I was concentrating on what I was doing or looking at checking the drug, so I was actually surprised to see it had gone because I had no clue that it had gone. Em so when I turned to literally put the needle in the sharps bin it had gone. Em however, there is a sharps bin in the bed side just next to it so I em it wasn't a great issue I just had to use that one. (Int 3 line 98-104) Interviewer: did that have any effect on how you were working your way through the process? Participant: I guess for a split second it distracts your mind into thinking where is it? Rather than 100% concentrating on what you are doing but I'll say it was a momentarily em distraction because another sharps bin was right by the side, it wasn't a problem that I had to go	• Preparation checks indicated everything needed was there. • So focused not noticed that someone had taken sharps bin • Surprised • Able to use another bin, not perceived as an issue • Split second distraction – where is it? • Not giving 100% concentration to medication • Momentarily distracted as another bin available	• PaP • FLC • ImN • IOC • IOI • IOI +ImN • IOI

and get a sharps bin or leave my sharps in an unsafe place. (Int 3 line 106-109) Interviewer: as you were totally unaware was there anything that could have prevented that? Participant: emm I guess to prevent it we could educate people not to take sharps bins off trolleys when people are doing drugs on those trolleys. (Int 3 line 111-112)	• Interruption perceived as worse if had to leave bed space and process or unsafe practice with sharps • Not interfere with trolleys when in use	• IOI • InOE
Interviewer: when you came to attach the correction to the lumen I was watching and saw that you were talking through what was running through all the lumens. Can you explain why you were doing that? Participant: I think it's because the patient we were looking after at the time had a triple lumen central line and had a lot of infusions infusing on those lines. There was a line with inotropes on, there was a line with morphine, midazolam and rocuronium on, a line with furosemide on, with a saline flush and a then a spare port on that line. So there was a lot of connections on the three lines, so it was a safety thing really, to make sure I was putting the potassium on the correct port of the correct lumen emm and often I will speak out loud about things like that so that whoever's checking it with me it's like a confirmed talked through process. Because often we put potassium infusions on a single line, we don't often put them something else running, so to put potassium with furosemide we know that its compatible, we can do it, but as there was a spare port on the inotrope line, which clearly we'd never put anything with	• Increased awareness of number of infusions attached to CVL • Talking out loud to checker about process is a safety strategy • A confirmed talk through process • Unusual to run potassium with another drug • Concerned that spare port on inotrope line may be accidentally used	• DrC • VCA • VCA + PT • ImN • IoE

inotropes so it was just em part of a safety check. (Int 3 line 116-125)		
Interviewer: then just as you were programming the pump to deliver that potassium, the physio came to the end of the bed space and asked if she could treat your child, as she asked that I was aware of you saying errr….. what was happening then do you think? Participant: so I was aware that I was in the process of programming the pump and she'd asked me a question, however, I knew I was nearly at the very end of administrating the drug so for the sake of 10 seconds I would be finished and I would be able to address what she was saying but I didn't want it, it's a little bit difficult cause I didn't want her to think I hadn't heard what she was saying at all or ignoring her em and obviously she should have realised we were doing drugs but again it's that em it's that education of somebody else realising that you're doing drugs and not interrupting you when you are doing them. So I guess it's a knee jerk reaction to make some sort of noise and almost make you realise you've heard them, but not speak enough to distract from programming the pump. And I knew that I was nearly at the end of the process so I would be able answer her correctly. (Int 3 line 129-137) Interviewer: so was that a conscious thought process or just reaction to it? Participant: I guess it's a reaction, a reaction to a voice that you've heard but you know you're not going to have a conversation of any length with them cause you're doing drugs. So yeah I guess it's a reaction rather than	• Nearly at end of programming delayed answering a question but indicated that question had been heard • Would answer fully when finished • Felt that if indication not given she would have been ignoring her. • Education of other staff • Reaction to interruption • Less of an interruption if conversation not entered into • Need to indicate that heard question • A reactionary noise to indicate they've been heard but can't talk	• CI + DDDI • DDDI • DDDI + BSR • IOR + ImEx • IOI • DDDI • DDDI • DDDI

saying nothing it's a reaction to make a noise. (Int 3 line 139-141) Interviewer: do you think your experience has any impact on that? Participant: Probably yes, yes I think through experience and doing yeah lots and lots of medication you realise the importance of not getting interrupted when programming pumps and stuff and obviously as senior staff we investigate incidents where we see where the errors occur. So yeah I think through experience you are more tuned into knowing you shouldn't stop and answer. Whereas that reaction in a junior member of staff might actually go on to be a sentence or two. (Int 3 line 143-147)	• Experience teaches the importance of not being interrupted • Experience of investigating incidents raises awareness (?sharing enough with junior team) • Perception that junior staff may not handle interruption effectively	• ImEx • ImEx • ImEx
Interviewer: the second episode of drugs you gave to the child was IV antibiotics and then some oral drugs. How do you prepare for that administration? Participant: so emm …. Oral antibiotics and …… Interviewer: it was IV antibiotics and then your orals. Participant: so we checked the doses I think of those before we started. We got the BNF and checked them. Well the cef no the IV we didn't because we know that's 50/kg so through experience I know that's 50/kg I couldn't honestly say whether checker picked the BNF up and checked it. (Int 3 line 152-154) Emm so we did the IV drugs first which I always do, I always separate the drugs so I'd never draw up IV drugs	• Checked doses with BNF • Experience and familiarity led the nurse to 'know' the dose of cef • Not aware of whether checker 'knew' dose or checked with BNF • Always separate IV from enteral drugs	• MM • DrC + ImEx • MM + NAP + ImEx • MM

and oral drugs up in the same session. So we did the IV drug first, em and administered that, em and again the preparation is making sure the trolley's there and the equipment you need is there and obviously you go to the drug cupboard and get your drug out and check the BNF and wash your hands and be more clean and them proceed with your administration. (Int 3 line 155-159) Interviewer: do you think any of those preparations have any effect on any interruptions? Participant: if you haven't got the equipment you need for delivering the drug then yes, because if you've forgotten something vital like you're making something in dextrose and you're making something in dextrose then you would have to stop to go and get your bag of dextrose out of the cupboard so that would be a big interruption to what you are doing. Even if you sent somebody else to do it cause you were clean em it's still a break in the administration of the drug so yeah. So yeah I think preparation has a lot to do with it. (Int 3 line 161-166)	• Preparation before administration; equipment, drug, dose check and wash hands • Preparation reduces risk of interruption from lack of equipment • Preparation is a key strategy to help reduce interruptions	• PaP • PaP + AR/PI • PaP
Interviewer: so whilst you were administering that IV antibiotic, a pump alarmed because the potassium infusion was low. You actually stopped administration to silence the pump, how do you decide how you are going to handle the interruption? Participant: so if an IV pump alarms I think the natural reaction and instinct is to look, it definitely, you couldn't ignore it because if my back's to the pumps I didn't know if it was the potassium infusion that was alarming that it was low or it could have been my inotrope pump that the	• Reaction and instinct is to look at alarming pump • Had to look in case it was problem with inotrope	• IOI • IOI + DrC

pressures had gone up and it had stopped I had, you had to turn round to have a look to see actually what it is em alarming and the alarm itself is distracting to what you're doing cause its loud em so I wouldn't be able to for one I couldn't ignore it cause I wasn't sure what drug it was and for two the noise is distracting of what you're doing so I think that makes you address the issue. If the checker the person who was with me, who was the second checker was behind me or closer to the pumps then they could deal with that for me, em but I don't think at that time she was. So that's why I spun round and had a look and I think I did silence it (Int 3 line 170-179)	• Alarm itself is distracting (loud) • Creates 2 types of interruption – noise and the question of why is it alarming • Second checker could deal with it but not in right place to access it • Possibility of problem with inotrope creates urgency – 'spun round'	• IOI • IOI • IOR • DrC
Interviewer: when you were checking the drug doses for the oral drugs in the second half of the episode. Em you had the BNF out and the drug keys were underneath your drug chart, I don't know whether you had any awareness or if you remember them being pulled out from beneath the drug chart. Participant: while I was checking the doses? No I didn't really, I was concentrating on what I was doing (Int 3 line 184-185) Interviewer: so how do you focus your concentration then, how does that work? How do you block out things? Participant: I guess ……. It's difficult to answer but I guess you block out almost unnecessary like noise and interruptions but you wouldn't block out like a shout for help or that sort of block so .. I guess you must be aware of your environment that's around you but you must be able to channel what's important and what's not. (Int 3 line 188-191)	• Concentration high during dose checking • Block out unnecessary noise and interruptions • Wouldn't block out shout for help • Situational awareness • Ability to differentiate between necessary and unnecessary	• FLC • AFPT • ADF • ADF • ADF

Interviewer: mmm Participant: because you wouldn't ignore me shout for help but you may ignore a conversation that is taking place behind you that was irrelevant to you or what you were doing. I don't know. (Int 3 line 193-194)	• Ability to differentiate between necessary and unnecessary	• ADF
Interviewer: when you were preparing, drawing up the oral potassium, there was a comment about the bottle being sticky, what prompted that and made you talk about it? Participant: it was sticky; I don't know I it was a natural reaction to say that it was sticky. I guess I didn't have to say that, it wasn't, it had no effect on anybody or the patient em, I don't know a natural comment that came out of my mouth I guess. Emm it didn't bear any influence on what I was doing as in it didn't matter that it was sticky it was a comment that was passed. Human nature I guess. (int 3 line 197-201) Interviewer: and how do you refocus your concentration after you have had a reaction like that? Participant: I think it just naturally happens I think I'm very careful with drugs and checking of them emm yeah I think it's just you focus straight back on what you were doing. I think it is a momentarily, it almost doesn't seem a distraction because I was still doing what I was doing when I said it. It wasn't as if I stopped put everything down while I said it, it's just like it comes out your mouth whilst you're doing things. So almost like unaware that it's distracting me. (Int 3 line 203-207)	• Natural reaction to comment on sticky bottle • Irrelevant comment • Natural comment • No influence on process • Human nature • Naturally able to refocus • Perceived to be careful about checking drugs • Not perceived as an interruption as process carried on not stopped. • No conscious thought behind comment • Lack of awareness of distraction	• CI • CI • CI • CI • CI • FLC • MM • IOI • CI • DTI

Interviewer: and then also during that preparation you were trying to aspirate with the syringe straight out of the bottle but there mustn't have been enough medicine in there so you had to stop and look for a pot. How did that affect your thought processes? Participant: em I guess again I would say it momentarily distracts you because you're looking for a pot in the trolley emmm … yeah you look for a pot so it does distract you, it does distract you momentarily of what you're doing, emm your second checker they could have realised that's what I needed and got one out without any speech but they may not have realised what I needed. I guess the way to get round that is to emm always have a pot out in case you can't get the drug out the bottle. In an ideal world. I could have tipped it a bit more but I might have spilt it. (Int 3 line 211-216)	• Momentarily distracts (distraction when process carries on rather than an interruption) • Second checker could have located pot (ability to understand what primary checker needs without using speech) • Locating a pot has less consequences than tipping bottle further	• DTI • IOR • DDDI
Interviewer: and then you were struggling to find the pH strips, did that have any influence on the process? Participant: again that was a distraction so em before as part of the preparation of drawing up those NG drugs instead of presuming they were there because we'd just aspirated the NG tube I should have made sure they were there on the right next to me at the bed side or on the trolley I was checking the drugs on, again part of preparation and getting all your equipment ready. So yeah, I looked in the drawers, they weren't actually in the drawers where they were, emm again that could have been something I wasn't aware of I could have presumed they were there because we had just used them, and unaware that someone had come and taken them out of	• Classified as a distraction • Assumption made that equipment still available (preparation checks did not check this fact) • Unaware another member of staff had removed them	• IOI • PaP + CoF • PaP

our bed space but yeah, part of preparation. I should have made sure they were there and out on the trolley to hand. (Int 3 line 219-226) Interviewer: and did it make any difference where you were in the process of discovering they were missing?	• Preparation should have checked for this	• PaP
Participant: I guess naturally it was going to occur when the drug had been checked and drawn up because it's at the point I actually wanted to administer the drug that I went to look for them, so the safety of checking the dose and actually drawing the drug up, had been done. Emm and I wouldn't have naturally looked for them any earlier really, had, no I wouldn't of. (Int 3 line 229-232)	• Missing equipment located at point in process when needed • Calculation and measurement phase completed • Perceived as safe place to occur	• PaP • FLC • FLC + STIP
Interviewer: and the final episode was the preparation of sedation, so morphine, midazolam and then the muscle relaxant rocuronium. How did you feel during that administration episode?		
Participant: so I felt quite comfortable with it because I'm used to doing it again I was aware that it was a much more junior member of staff that I was checking the infusions with. And may, that member of staff may not have actually checked lots of emm infusions like that in the past. Emmm and there was a lot to do in one go because all three infusions needed changing in the same go, so I think with that you know you're going to be busy for quite a long period of time. And obviously because you are preparing 3 at one time you have to be very careful and methodical how you are preparing them, how you are labelling them, so that no error occurs and you don't mix them up. However, the environment was good to do it at the bedside on this said day. Because again it	• Comfortable due to familiarity • Second checker much more junior • Lack of experience with infusions • Multiple infusion change • Long process • Careful and methodical when multiple infusions involved • Preparation and labelling help prevent errors • Environment good for bedside checking to day – quiet and not in charge	• ImEx • ImEx • ImEx • DrC • DrC • DrC • PaP • IOR + InOE

was relatively quiet, I wasn't the nurse in charge I was the bedside nurse, emm I don't think the parents, mum wasn't there at that time so the bed space was quite quiet so it felt, em it felt the right environment to be doing it in, so interruptions I guess would be minimised (Int 3 line 235-245)	• Parents not present contributing to good environment • Reduction in interruptions	• PI • AR/PI
Interviewer: did you feel like interruptions occurred? Participant: emm I was aware in my head that the ward round had started and that they were, they'd edged towards, they were at the patient before my patient so subconsciously in my head I hoped that I'd got the infusions complete before the ward round had got to me cause obviously that would have been a distraction so subconsciously I was aware of that but I wasn't aware, I wasn't aware of any other distractions around me, or in my bed space at that time. (Int 3 line 247-251)	• Awareness of ward round starting • Wanted to complete infusions before ward round started • Perceived ward round to be a distraction • Aware of no other distractions	• IOI • RI • IOI • IOI
Interviewer: so whilst you were writing the labels, mum was there at the start, but while you were writing the labels for the infusions and you sort of stopped half way through to speak to her, I hadn't notice her ask a question but what made you stop and speak to her about the doctors? Participant: ok, so the mum had been anxious and I was aware she was there at the point I was doing this, so again as part of preparation if the other nurse is not quite ready to check the infusions I like to start because it was a job that needed doing so I was writing the labels out, we'd already checked the infusions were right with the patient's weight at the start of our shift, I didn't way that previously but we'd checked the pump programmes and	• Parent anxious • Preparation starts without checker • Labels written out without checker present • Infusions correct for weight, checked at start of shift • Programme checked at start of shift	• PI • PaP • PaP • PSC/MM • PSC/MM

were happy it was the right drug and the right dose is going through and the pump is programmed properly, so we'd already checked all that so I was purely writing out the new labels for the new syringes em which I knew I would check again with my second nurse when she returned, em before we'd put that label on the syringe so I felt it was a safe and appropriate time to pause what I was doing to be able to support that parent and to update her with regard to what was going on. (Int 3 line 255-264)	• Only writing labels which would be checked again in process • Safe to stop writing and support anxious parent	• PaP + MM + repeated checks (RC) • PI + Safe time in process (STIP)
Interviewer: why did you when you'd finished writing your labels, you went off to find another blue tray, to prepare your drugs on, was there a reason? Participant: I went to get another blue tray because all the CD's out of the cupboard had been carried out on the blue tray that I'd previously been using and I guess in my head I was still preparing although I guess the administration, the medication process probably started when I was writing those labels. It didn't feel like it had properly started so I was still in that preparation, I was like in the preparation process so part of the preparing had been to write the labels, to check the drugs, to get the drugs out and the equipment out. Emm so I didn't feel walking away at that point to get a blue tray was distracting me from thinking about what I was doing with the medication. And I needed that tray to carry out the task I couldn't have done it without a blue tray. (Int 3 line 267-274) Interviewer: and while you're away do you continue to think about medication while you are getting that tray?	• Perceived to be still preparing when going to get another tray • But medication process began when labels were written • Felt that not properly started administration • Preparation was to write labels, check drugs and get equipment • Leaving bed space to get tray not perceived as distraction due to position in process • Necessary equipment	• PaP + IOI • STIP • STIP • PaP • IOI + STIP • PaP

Participant: emm I'm aware that I'm going to, I guess I'm not constantly going over in my head what drugs I'm going to do and stuff because they're familiar to me. Emm but obviously I know that I'm going to be doing drugs cause I'm going to get a blue tray that I need to be able to do the drugs on. So that I know that I'm in the preparation phase of doing the drugs I guess (Int 3 line 277-280)	• Familiar drugs reduce worry about process • Preparation phase of process	• ImEx + ImN • PaP
Interviewer: and also during that time as well a pump alarmed for a flush and again you silenced it and switched it off. Is that for the same reasons as before? Participant: yeah I mean I think that time I was probably more aware that it would be the flush but again I couldn't ignore a pump alarming for the same reasons cause you just don't know what it is. Emm and the noise is distracting and because we were doing a lot of drugs emm it would have been too distracting to leave that alarming again. The second nurse, that is something the second nurse could have however, in that process of doing all those drugs the second checker nurse was very involved checking things as we were swapping them over one by one anyway because you have to be careful what you are taking off is what you are putting back on, she was also putting the syringes in the pumps and concentrating that she was putting the right drug in the right pump but yeah arguably she could have silenced that and turned it off for me which would have distracted me less from the point of what I was doing. (Int 3 line 283-292)	• Can't ignore pump alarm as unsure which one it is • Pump alarm is distracting • Too distracting to leave whilst drawing up drugs • Role of second checker could have silenced pump so less distraction for primary checker • Second checker more involved in multiple infusion change • Multiple infusions, increased risk of putting wrong syringe in wrong pump.	• IOI • IOI • IOI • IOR • IOR • DrC
Interviewer: so when you had that break that break between your preparation and the start of making the		

drugs, how do you refocus, what goes through your mind when you are starting up again with the task? Participant: I think I just naturally go back into and just think right ok, I just go back into it almost like automatic pilot, I know what point I was at and I can see that by literally what I was doing emm I just continue on, I don't feel distracted, I don't keep thinking about the pump alarming or what I've just done to the pump I focus straight back on the task and I think that by focusing on what you're doing blocking out the other external stuff and like just regrouping yourself and getting on with, with what the process in hand and whether that comes through experience, channelling straight back on it probably does emm, I can yes, I can get my mind straight back on what I was doing. (Int 3 line 296-302)	• Able to refocus using automatic pilot • Awareness of position in process • Visually see what point they are at • Forget about interruption immediately and focus on task • Able to block out by focusing • Experience improves ability to refocus • Able to immediately forget interruption and focus on task	• RS • ADF + RS • VI • RS • RS • RS + ImEx • RS
Interviewer: whilst you were drawing up the dextrose for the morphine infusion you glanced over at your patient, can you remember why? Participant: I think just drawing up, when you are just drawing up your dextrose in your syringe I guess you've almost got a second to like, have a thought about things and because he's a ventilated patient, I do like to eyeball the observations to make sure although the alarm limits are set on the monitor I do often, I do glance at the monitor to check, to see what the numbers are doing for that split second when I'm drawing up the dextrose. Almost like multitasking, I don't feel it's a distraction it's a normal sort of like a natural thing to do. When you 've got a pause, not a pause in what you're doing cause you are doing your drugs but it's an opportunity to have a	• When just drawing up fluid able to think about other things • Wanted to assess patient by eyeballing observations • Like multitasking • Not perceived to be a distraction it's a natural thing to do • Drawing up large volumes of fluid likened to a pause	• FLC • ADF + RPC • IA • FLC • PSC

quick glance at a monitor without distracting what I'm doing. (Int 3 line 305-312) Interviewer: and what information do you take in? Participant: so from quickly glancing at the monitor em it depends, obviously from a quick glance you wouldn't be able to memorise every set of observations but he', because he's on inotropes he'd had issues with his blood pressure so I was quickly glancing to see what that was and to make sure his saturations were ok. (Int 3 line 34-317)	• Opportunity to assess patient • Ability in a glance to note that BP and sats were appropriate	• PSC + VI
Interviewer: you were questioned by the checker as to how long morphine is stable for? Did this distract you at all? Participant: not really, it didn't distract me and it's probably part of the checking process. She was wanting a confirmation of what she thought was right so I guess it's part of, it's part of the safety checking of the drugs that she's asked a question she wasn't sure of, and it was a very simple questions with a very simple answer. And it was relevant to what we were doing. (Int 3 line 320-323) Interviewer: can you remember how you dealt with it? Participant: I think I carried on what I was doing and answered it. Interviewer: is that a usual method of dealing with it? Participant: it depends what, it depends what's been asked of you, if it's something like that a simple question with a simple answer, had it been more complex and it meant for example having to show her in the	• Questions about drugs are part of the checking process • Junior nurse confirming correct information • Relevant to process so not seen as a distraction • Handling depends on complexity of question • If a complex answer is required conversation is delayed	• IOR + IOK • ImEx • AOC • CI • CI

pharmacopeia a drug dose or checking like that then, then that would have been more distracting and I wouldn't, I wouldn't have stopped and had the same conversation with her. Then I would have carried on what I was doing and at an appropriate time when I could safely put the drug down in the tray and pause and we'd sort that out and do it then. So it depends what the question was I think, it's relevant I think it's relevant dialogue to what you're doing so it was all to do with the drugs that we were using and it was safety and its right for her to question if she's unsure about something we're doing em but I'd say it's very much depending on what that question was as to how full you give the answer if she'd have asked me a more detailed question I might have just said hang on a second we'll discuss it in a minute so that I could concentrate on just doing what I was doing so that an error didn't occur. (Int 3 line 327-338)	• Asking questions about relevant drugs is appropriate	• IOR
Interviewer: and then the midazolam label box was empty. Participant: yeah part of checking, preparing, presuming that because there was a box in there it had labels in it, but quite clearly it was empty when I got it out so yes, so we could of, we could have carried on and put that syringe, I mean the syringe had the label on it of the handwritten, handwritten label so we knew it was midazolam, so we could, we could of carried on and got the orange labels at the end. I didn't ask her to go and get some, she said oh, I'll go and get some and she went and got some so arguably it's more safe if it's labelled with the orange stickers at the time em distracting yes, part of preparation, maybe she could have got the	• Failure in preparation • Safer to be labelled in coloured stickers	• PaP • MM

stickers out of the top draw of the trolley before I started but I presumed because there was a box, that it was empty, full sorry. And it wasn't so, yeah a distraction to what we were doing, again I don't think enough to distract me from what I was doing because it was a safe point almost, cause I'd drawn the drug up in the syringe the label was on the drug, it was almost a natural pause in what we were doing. She went and got the labels we put them on and moved on to the next drug. (Int 3 line 340-351)	• Occurred at safe part of process when calculation and drawing up completed	• STIP
Interviewer: and during the preparation of the midazolam the pump alarmed for a continuous saline flush, that seemed to be a bit of a surprise? Participant: I was, it was I wasn't, I hadn't planned to make up another saline flush at that time and I hadn't realised it was going to run out whilst we were doing our else I may have done that one first and put that one up so there was no distraction of an alarm before we started but I hadn't realised it was going to alarm to be honest. (Int 3 line 354-357) Interviewer: you then actually stopped the drug preparation between the midazolam and the roc to prepare that saline, why did you choose to do that? Participant: so I was going to, so my first train of thought was because it had alarmed, the reason it was running, it was running along the furosemide because the furosemide was running at such a small amount of mls/hr, it was running aside that to keep the line patent and my first thought was to make a new one up and get it	• Unexpected event • Would have completed task differently • Assessment of actions required • Maintenance of line patency	• IOC • LFE • ADF • PSC

going so the line didn't bleed back or there wasn't any issue with the line so for line patency em and whilst I was clean I could do that so I started to do that surely what we did, we drew up because it was a very quick thing to draw up, we drew up 20mls of saline, however, then as I was drawing it up I changed my mind set because I realised that the only infusion I had left was rocuronium that we'd already checked and again is a very quick infusion to em draw up so I decided at that point to draw the rocuronium up so that I wasn't completely distracted and having to walk around to the other side of the bed space to put the saline flush on and also em making myself almost dirty by touching the pumps and the patient and all that sort of stuff, it would have been a longer break em to getting back to the task so I decided em literally the sake of a minute that it would have taken me to draw up the rocuronium I would carry on and then take the whole drug tray around to the other side of the bed space and em change the saline first as part of the change of the whole set of infusions. (Int 3 line 360-374)	• Reassessed and changed plans • Process influenced by actions required when making infusions • Chose not to instigate a complete break in the process	• IOC • DrC • DDDI
Interviewer: after I think, while you were drawing up the rocuronium, you did glance over at the ward round, can you remember why? Participant: I think I was aware that em like I said before they were at the patient before mine so I was aware they were getting close to coming to me and I was in the middle of doing drugs and I didn't want them to come to the bed space while I was in the process of changing infusions over so I think it was a subconscious where are they? Sort of a look. (Int 3 line 377-380)	• Situational awareness of ward round • Constantly aware of pressure to finish drugs before ward round arrives	• InOE • InOE + AR/PI

Interviewer: and then a pump alarmed again for the saline but I wasn't convinced you had noticed it? Participant: I think I knew, I think I knew what that was alarming so and I knew I'd drawn one up so I don't think I silenced it that time did I? Interviewer: no the checker went Participant: to silence it, so I knew because I'd put it on hold I think I was confident that time that I knew what that was that was alarming so I continued so that I could get the drugs done so that I could swap it over.	• Able to predict the cause of pump alarms • Under pressure from ward round • Able to block alarm • Checker silenced it	• IOI • InOE • InOE • IOR
Interviewer: and whilst you were attaching the infusions the cardiac test bleep went off. What went through your head then cause you did take notice. Participant: so like we said before about knowing what's important distractions and what's not that bleep is something when it does go off you don't ignore it so that, it's very loud and it's a distinguished thing so your ears and your attention is automatically pulled to what that bleep is saying, at the same time I was listening to the bleep going on I looked at the clock to see if it was the time, around about the time that when they do the test calls. And it was, but as the senior person on the shift em you're tuned into listening for that bleep. So I wanted to listen to that bleep to make sure it wasn't an arrest call that had gone off. (Int 3 line 391-397) Interviewer: did that affect what you were doing at the time? Participant: it paused me from what I was doing because I didn't carry on what I was doing and listen at the same	• Test bleep an important distraction • Loud and distinguished • Focus drawn to bleep and voice • Experience knowing when test bleeps occur • Senior nurse on shift needs to listen • Caused a break in process	• ADF • IOI • IOI • ImEx • ImEx • IOI

time I stopped what I was doing momentarily to listen so that I could concentrate to be fair on what the bleep was saying. Which I'd rather do, rather than trying to do two jobs at once cause that's not safe and it isn't and yeah it's important and that bleep going off is a big distraction because it doesn't always go off, it doesn't go off once it often goes off 3 or 4 times and it's really loud. And it's something you know you can't ignore so it is a distraction but a distraction that you can't ignore. (Int 3 line 399-405)	• Concentration switched from medication to bleep • Not doing 2 jobs at once (seen previously) • 2 jobs at once not safe • A big distraction that can't be ignored	• FLC • ADF • ADF • IOI
Interviewer: and just as you were finishing off the receptionist appeared at the end of the bed with some paperwork. Participant: if I did know she was there it wasn't a big distraction because I don't actually remember her being there to be fair. Did she speak to me? (Int 3 line 410-411) Interviewer: she spoke to your checker Participant: ok, it didn't distract me, I wasn't really aware she was there (Int 3 line 413)	• Ability to block the presence of another person • Second checker dealt with issue	• Ability to focus on priority task (AFPT) • IOR
Interviewer: so now that we've gone through the distractions and interruptions, looking back would there have been anything you would have done differently? Participant: so I guess it highlights the importance of preparations that you don't have to look for anything during the process, so maybe thinking the whole process through a little bit better and making sure like you've got labels in your boxes and not presuming that just cause the box is in there it's got stickers in it. Em so I think lessons can be learned about preparation definitely making sure absolutely everything is there. (Int 3 line 416-420)	• Importance of preparations in more detail	• PaP

Like I said today the environment was quite conducive cause it was relatively quiet round our bed space emm so the environment today was quite, quite good. I am aware the environment can be very distracting just from general noise and the physical amount of people and stuff here. (Int 3 line 420-423) Em I guess it makes you more aware of what is a distraction when you're doing your administration and again I think probably through experience you know to channel the stuff out that isn't relevant and can wait and doesn't need to be dealt with immediately however, again may be through experience your ears prick up when you hear the arrest bleep go off and you can never, you know that's something you need to listen to so although it's a distraction it's a necessary distraction to you. (Int 3 line 423-428) So yeah I think em I think because I've been here a long time and you do a lot of drugs on a daily basis you don't step back and have a really close look at what you do. Or question what you do, so much, so by this, yes definitely lessons to be learnt, probably more around preparation, not so much around the safety of the drug, the equipment probably more so, em because I think I'm quite methodical in checking drug doses and all that sort of stuff before we start actually physically drawing up the drugs. Em may be just checking the draws a bit more thoroughly you know getting the pH strips out, which I probably have never done it the past, but perhaps I need to change my practice and make sure everything is laid out in front of me before I start. (Int 3 line 428-435)	• Importance of quiet environment • Importance of the ability to focus but have situational awareness • Impact of experience on situational awareness • Impact of not questioning method and procedure – the way it's always done • Perceived that a lot of problems relate to poor preparation • Happy with safety checks	• InOE • ADF • ImEx • Acceptance of culture (AOC) • PaP • PSC
Interviewer: and just to finish is there anything you want to add that we've not talked about?		

Participant: em only to say that I think it very much depends so not very much depends, but it can depend on the role you're allocated on the day, so for example I feel that if you're the nurse in charge on a busy shift, em and you are the second checker I think you get a lot more interruptions because you are the nurse in charge, you are the nurse that everybody comes to. I think education of other people, people don't stop and think oh you're doing drugs I'd best not talk to you, they see you as the nurse in charge and come and disrupt you with anything, no matter how important or not. So I think, I think it is role dependent a little bit too. All that can have a strong influence on the amount of interruptions em to medication. And the environment, even from like a weekday, like a Monday morning weekday to may be a weekend day because it tends to be a little bit quieter on the nights and at the weekends and just like the whole, like today the environmental noise was low, there wasn't lots of people around, it was a good environment, in the week the actual environment the noise, the environment can be really distracting because naturally it's just loud and you have to work harder to channel yourself into what you're doing. I think through experience you can, I don't know it would be very interesting with the junior members of staff to find how distracting that is to them, cause I would imagine probably a lot more because they're not so used to the environment.	• Impact of role – nurse in charge checking drugs gets more interruptions • Education of others is important • Not all interruptions are important • Impact of weekday v weekend/nights • When it's noisier its harder to focus and concentrate • Experience helps with focusing	• IOR • LFE • IOI • InOE • InOE • ImEx

Code	Definition
Medicines management (MM)	Safety of medicines and prescriptions within PCC environment Actions that were observed or rationalise to maintain the safe storage and availability of medication.
Non-adherence to policy (NAP)	Practice that does not follow hospital or NMC guidance
Ineffective intervention (IEI)	Interventions that have been implemented that are ineffective or are perceived to be
Influence of role (IOR)	Roles within nursing and their influence Roles within PCC team and their influence Inter-departmental roles and their influence
Patient Safety Check (PSC)	Description of checks taken which contribute to patient safety including medication
Effective intervention (EfI)	Interventions that have been implemented that are effective or are perceived to be
Missed opportunity (MO)	Checks not made or only partially completed
Communication (Com)	Impact of all forms of communication on medication
Learning from experience (LFE)	Evidence of learning from previous errors
Interruption awareness (IA)	Individual nurse awareness of interruptions
Response to patient condition (RPC)	Patient condition directs nursing actions
Action to reduce/prevent interruption (AR/PI)	Decisions or actions taken by nurses to prevent or reduce interruptions Actions that are perceived to reduce interruptions
Desensitisation to interruptions (DTI)	Demonstrating lack of awareness to interruptions and abilities to ignore or block interruptions
Conversational impact (CI)	Impact of conversations and impact of content within conversations Complexity of answer required
Fluctuating levels of concentration (FLC)	Description of concentration levels within process Actions taken because specific concentration level required
Deflecting/downgrading/delaying interruptions (DDDI)	Managing a situation by deflecting / downgrading or delaying interruptions
Ability to dual focus (ADF)	Identification of ability to focus on more than one task and prioritise between tasks and have situational awareness
Impact of interruption (IOI)	Impact of interruption on actions, decisions or patient Reactions to interruptions
Being seen as rude (BSR)	Identification of delaying conversations (ignoring) as rude
Recovery strategies (RS)	Tactics used to remember position in process
Creation of frustration (CoF)	Actions that create frustration in nurses
Parental influence (PI)	Actions, decisions, conversations influenced by the presence of parents

Verbally confirming actions (VCA)	Talking out loud to confirm actions taken
Visual importance (VI)	Descriptions of visual cues
Maintenance of professionalism (MOP)	Actions described or taken that affect professional image
Impact of normal (ImN)	Effects of drugs and procedures which are normal and those that are different to the norm
Planning and Preparation (PaP)	Actions observed that planned medication activity Individual planning for administration
Impact of change (IOC)	Actions and feelings that are an unexpected situation
Researcher impact (RI)	Comments or actions that indicate presence of researcher altered normal behaviour
Drug complexity (DrC)	Impact of administering complex drugs or complex bundles of drugs
Impact of errors (IoE)	Comments or actions influenced by worry of making an error
Influence of environment (InOE)	Environmental factors which influence medication activity positive and negative Including staffing
Impact of experience (IoEx)	Actions or comments that demonstrate experience can affect actions or decisions
Repeated checks (RC)	Actions or comments which indicate checks are repeated at different stages of the process
Safe time in process (STIP)	Identification that there are certain points within the process which are perceived to be safer to stop in than others
Ability to focus on priority task (AFPT)	Ability to isolate priority task and ignore interruptions
Acceptance of culture (AOC)	Indication that processes are carried out as always done
Medication as a priority(MAP)	Prioritisation of medication over other nursing care
Saving time (ST)	Actions taken that are perceived to save time
Impact of knowledge (IOK)	The role of having or missing knowledge in medication administration
Seeing process as a whole (SPW)	Actions or comments which identify process as a whole rather than separate sections
Teaching versus administration (TVA)	Conversations or actions that relate to the delivery of a combined teaching and administration scenario
Personal Touches (PT)	Actions woven into the process by personal preference which are perceived to improve safety

Appendix 7

Coded field notes

Observation 3

Data	Master Codes	Sub Codes
28/2/16 08.40-10.40 Background Staff on duty: band 7 x1, band 6 x2, band 5 with crit care course x1, band 5 with more than 6 months experience x 1 and band 5 with less than 6 months' experience x1 Level 2 patient x 1 and level 3 patient x2 Calm, quiet atmosphere. I parent present in another bed. (0bs 3 line 2-5)	• Calm environment	• ImOE
Episode 1 08.40-08.45 Patient dependency level 3 Staff involved band 7 and band 5 NQ Administration of potassium infusion (obs 3 line 6-8)	• Complex drug	• DrC
Interruption 1 Drug preparation carried out at portable IV trolley. Housekeeper removed sharps bin from trolley whilst nurse facing the other way. Nurse surprised when she went to place sharp in it as bin no longer present. Caused a distraction as she looked around for the bin and decided to use another bin in the bed space. Administration stopped briefly whilst looking for bin and locating another Ignored return of sharps bin (obs 3 line 9-16)	• Use of portable IV trolley • Housekeeper removed sharps bin • Nurse unaware • Nurse reacted with surprise • Nurse looked around for bin • Used alternative bin • Drawing up stopped whilst looking for bin • No response when bin was returned	• ImOE • IOC • AFPT • IOI • IOI • IOC • IOI • AFPT
Interruption 2 Clarification of drugs running through the CVL lumens: sedation and muscle relaxant, inotropes, furosemide	• Verbal confirmation of what's running through lumens	• VCA + PT

Discussed that they were happy to run potassium with furosemide Drug administration continued, discussed whilst still cleaning the port (obs 3 line 17-21)	• Discussion of compatibilities • Discussion held whilst cleaning port	• IOK 1+ CI
Interruption 3 Physio asking to treat patient while nurses programming pump Finished task before answering fully but delayed answering by saying errr……. (obs 3 line 22-24)	• Physio asking to treat while programming pump • Acknowledged question with errr • Waited to finish before holding full conversation	• Com • DDDI • STIP
Episode 2 Band 7 and band 5 NQ Administering IV antibiotics and oral drugs (obs 3 line 26-28)	• Multiple drugs	• DrC
Interruption 1 Pump alarmed whilst IV being administered to patient Administration stopped to look at pump (obs 3 line 29-31)	• Pump alarm • Administration stopped to respond to pump	• ImOE • IOI
Interruption 2 Keys pulled out from under drug chart whilst checking doses Checking process continued No sign of acknowledgement given to indicate awareness (obs 3 line 32-35)	• Keys removed from under drug chart • Drug chart in use to look at prescription • Checking continued • Unaware of key removal	• IA • MM • IOI • IA
Interruption number 3 Drawing up oral potassium bottle noted to be sticky. One comment from each nurse noting sticky bottle Process continued able to talk and draw up volume at same time (obs 3 line 36-39)	• Sticky bottle initiated conversation • Conversation and drawing up completed at same time	• VI • ADF

Interruption 4 Needed to locate a medicine pot as unable to draw volume of medication out of bottle with syringe Process stopped whilst pot located (obs 3 line 40-42)	• Missing equipment • Process stopped	• PaP • IOI
Interruption 5 Needed to locate pH strips as unable to find them Process stopped whilst looking in all draws for pH strips Process stopped between drawing up and administering. (obs 3 line 43-46)	• Missing equipment • Process stopped • Occurred between drawing up and administering	• PaP • IOI • STIP
Episode 3 10.02-10.35 Drawing up morphine, midazolam and rocuronium Band 7 and band 5NQ Mum in another bed space clearly describing illness pathway of her child. Ward round increased noised levels during preparation of rocuronium Mum and Grandma arrived just before starting drawing up (obs 3 line 48-53)	• Multiple drugs (commonly used) • Background noise of parent conversation in other bed • Increased noise from ward round • Parents arrived during process	• DrC • ImOE • ImOE • PI
Interruption 1 Whilst writing labels answered mums question about doctors rounds and getting information Completely stopped writing label (obs 3 line 54-56)	• Writing drug labels • Answered questions from mum about ward rounds • Stopped writing labels	• PaP • PI + ADF + Com • IOI
Interruption 2 CD's had been signed out of cupboard and labels written. Nurse then left area to locate another blue tray.	• Cd booked signed and labels written • Blue tray located from another area	• MM • PaP

Preparation stopped and nurse completely disengaged with task left all drugs with other nurse (obs 3 line 57-60)	• Process stopped • All drugs left with checker	• IOI • MM
Interruption 3 Pump alarmed to note end of flush of previous drug (Potassium) Preparation of current drugs stopped. Pump silenced and switched off. Syringe removed from pump by primary checker. (obs 3 line 61-64)	• Pump alarm, flush ended • Drawing up of drugs stopped • Syringe removed from pump	• ImOE • IOI • IOI
Interruption 4 Primary checker glanced over at patient whilst drawing up 5% dextrose Task of drawing up continued (obs 3 line 65-67)	• Primary checker looked at patient • Whilst drawing up 5% glucose	• RPC • STIP
Interruption 5 Question from checker about length of time morphine stable for. Is it stable for 24 hours? Preparation continued and question answered with one-word yes (obs 3 line 68-70)	• Question about drug stability from junior nurse • One-word answer from primary checker	• IOK + TVA • DDDI
Interruption number 6 Primary checker went to pull a midazolam label out of the box. Box was empty Primary checker continued with process whilst second checker went to another trolley to locate some (obs 3 line 71-74)	• Missing equipment • Located by checker • Process continued by primary checker	• PaP • IOR • IOI
Interruption 7 Pump alarmed Primary checker continued with process and asked checker to silence pump. Primary checker wasn't expecting this flush to finish so stopped current drugs to draw up new 0.9% saline flush. This occurred between	• Pump alarmed • Checker asked to silence pump • Unexpected ending of flush • Drawing up of drugs stopped to draw up new flush	• ImOE • IOR • IOC • IOC + IOI

finishing midazolam infusion and starting rocuronium infusion. (obs 3 line 75-79)	• Occurred between 2 infusions	• STIP
Interruption 8 Whilst drawing up rocuronium drug primary checker looked over at ward round. Drawing up continued (obs 3 line 80-82)	• Drawing pre-made medication out of vial, primary checker glanced at ward round	• ImOE + ADF + FLC
Interruption 9 Pump alarmed and silenced by checker Primary nurse gave no indication that she heard it (obs 3 line 83-85)	• Pump alarmed • Silenced by checker no response from primary checker	• ImOE • IOR + IA
Interruption 10 Clarification of what was running through each lumen. Primary checker replaced one drug at a time. She spoke out loud the name and dose of each drug when swapping syringes over Part of process of swapping. Administration continued (obs 3 line 86-89)	• Verbal clarification of drugs running on which lumen • One drug replaced at a time • Each drug name and dose spoken out loud	• VCA • MM • VCA
Interruption 11 Bleep sounded loudly for cardiac test call. Caused both nurses to look over. Noise very loud as 2 bleeps went off at same time. Administration stopped as both nurses waited to hear message (obs 3 line 90-93)	• Cardiac test bleep • Both nurses looked • Very loud as nurse and doctor bleep sounded • Administration stopped as nurses listened to message	• ImOE • IOI • ImOE • IOI
Interruption 12 Receptionist removed paperwork from desk. Conversed with checker Primary checker gave no indication she heard or noticed receptionist. Administration continued (obs 3 lin3 94-97)	• Paperwork removed from desk by receptionist • Spoke to checker • No response from primary checker • Administration continued	• IA • IOR • IA • IOI

Appendix 8

Analytic Memo

Analytic memo for focus, concentration and awareness

Actual

The patient is at the centre of all medication administration. Within critical care the condition of the patient can change dramatically within minutes. Within the patient safety checks alarm limits are set appropriately for that child. When an alarm is heard the nurse knows that patient condition has changed to outside of the limit they have set, so they need to respond to see if action is required. Performing an activity such as turning a patient can reduce interruptions by improving stability such as increasing lung volumes improving ventilation. However, it can also have the opposite effect.

The history of the child's condition also has an impact on responding to patient condition. If there has been a history of extreme instability for example requiring resuscitation any change in observations will initiate a response which is likely to be a complete stop in administration and focus will move to the child whilst they assess whether intervention is required. One patient was experiencing ectopics which could trigger a VF rhythm when she deteriorated the nurse stopped for 4 minutes until stability returned.

The requirement of responding to patient condition impacts on focus and concentration. Unless the drug is unfamiliar or complex the nurse will always be aware of changes in patient condition. If close concentration is required nurses demonstrated an ability to zone in on the process or calculation and ignore alarms.

Empirical

There appeared to been an acceptance of interruptions there were occasions when interruptions were underestimated. Participant one stated that they felt they had experienced 3-4 interruptions when they had experienced 11. Participant 7 only recalled one interruption when there were more than that. The distraction was another nurse which appeared to erase all other interruptions. Acknowledgement of self-interruptions. One experienced nurse found it very distracting when patient conditions stopped her from starting her administration. One participant noted that if they were not responsible for the patient where alarms are happening they would hope someone else would attend. Environment of side room had impact on numbers of interruptions. Awareness of monitors alarming around them. Perception of increased awareness if patient condition was unstable.

Occasions where nurses had an ability to focus on more than one task. If a patient is unstable they will watch monitor whilst drawing up drugs. An ability to block out unnecessary noise but still hear 'a shout for help'. Unable to give 100% attention to other tasks if drugs are left out whilst responding to patient. Able to draw up medicines, check sats are above 90% and check ventilator not in apnoea ventilation. Need to decide whether to intervene with patient or leave alarm if not important – clinical assessment. Have an awareness of background conversations but not listen to content. Ability to recognise different alarms and their meaning. Always know that drugs are out there when dealing with other tasks. Watching the monitor and the patient whilst administering drugs.

However, ability to completely focus on task in hand and ignore all interruptions. No awareness of a parent singing whilst drawing up medication. Block out all unnecessary noise. When administering a bolus medication concentrating on rate of administration and watching the clock. Awareness of trying to concentrate. Participant 8 zoned out. Even when focused there are key alarms which will break the focus. It's easier to filter out unnecessary noise when its quiet.

Real

The acceptance of interruptions has created a tolerance of interruptions. It was standard to be interrupted, when interrupted 11 times it felt like a normal uninterrupted episode. There needed to be enough interruptions to be aware. Lack of awareness of interruptions that did not involve other people – I didn't get called (but there were 15 interruptions). One episode when the nurse was repetitively interrupted whilst trying to check a dose in BNFC. Was just one of those things that happen. Its normal to get interrupted when making up medicines. Having the wrong drug was an inconvenience even though the nurse had to locate the keys and leave the area to find the right drug.

Conversations can originate from; the nurses administering, the rest of the medical team and parents. Conversations between nurses can be discussions about clinical decisions, administration issues or less professional topics. Medical and AHP will initiate conversations regardless – impact on their time. Long ward rounds impact on time available for medication administration although important for patient progress and safety long ones can create a domino effect on other care. Environment can initiate conversations – hot, impact on well-being at work attempting to improve working environment.

Appendix 9

HRA guidance

Go straight to content.

NHS
Health Research Authority

MRC Medical Research Council

Is my study research?

To print your result with title and IRAS Project ID please enter your details below:

Title of your research:

Understanding the decisions made by Paediatric Critical Care nurses when interrupted during medication administration: an exploratory study

IRAS Project ID (if available):

You selected:

- **'No'** - Are the participants in your study randomised to different groups?
- **'No'** - Does your study protocol demand changing treatment/ patient care from accepted standards for any of the patients involved?
- **'No'** - Are your findings going to be generalisable?

Your study would NOT be considered Research by the NHS.

You may still need other approvals.

Researchers requiring further advice (e.g. those not confident with the outcome of this tool) should contact their R&D office or sponsor in the first instance, or the **HRA** to discuss your study. If contacting the HRA for advice, do this by sending an outline of the project (maximum one page), summarising its purpose, methodology, type of participant and planned location as well as a copy of this results page and a summary of the aspects of the decision (s) that you need further advice on to the HRA Queries Line at **HRA.Queries@nhs.net**.

For more information please visit the **Defining Research** leaflet

Follow this link to start again.

Print This Page

Appendix 10

Coventry University Ethical Permission

Please note that there has been a slight change in the title of the thesis since ethical review was granted. This did not affect the aim or method of the study.

Certificate of Ethical Approval

Applicant:

Rachel Bower

Project Title:

Understanding the decisions made by Paediatric Critical Care nurses when interrupted during medication administration: an exploratory study

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as High Risk

Date of approval:

15 January 2016

Project Reference Number:

P37812

Appendix 11

Trust Research and Innovation authorisation

research & innovation

Nottingham University Hospitals NHS
NHS Trust

Research & Innovation
Nottingham Health Science Partners
C Floor, South Block
Queen's Medical Centre Campus
Derby Road, Nottingham NG7 2UH

Tel: 0115 9709049
www.nuhrise.org

2nd February 2016

Ms Theresa Pengelly
RC220 Richard Crossman Building
Coventry University
Priory Street
Coventry

CV1 5FB

Dear Ms Theresa Pengelly

Short Title / Acronym	Understanding the decisions made when interrupted /
CSP Number	
R&I REF	16CS004
Long Title	Understanding the decisions made by Paediatric Critical Care nurses when interrupted during medication administration: an exploratory study

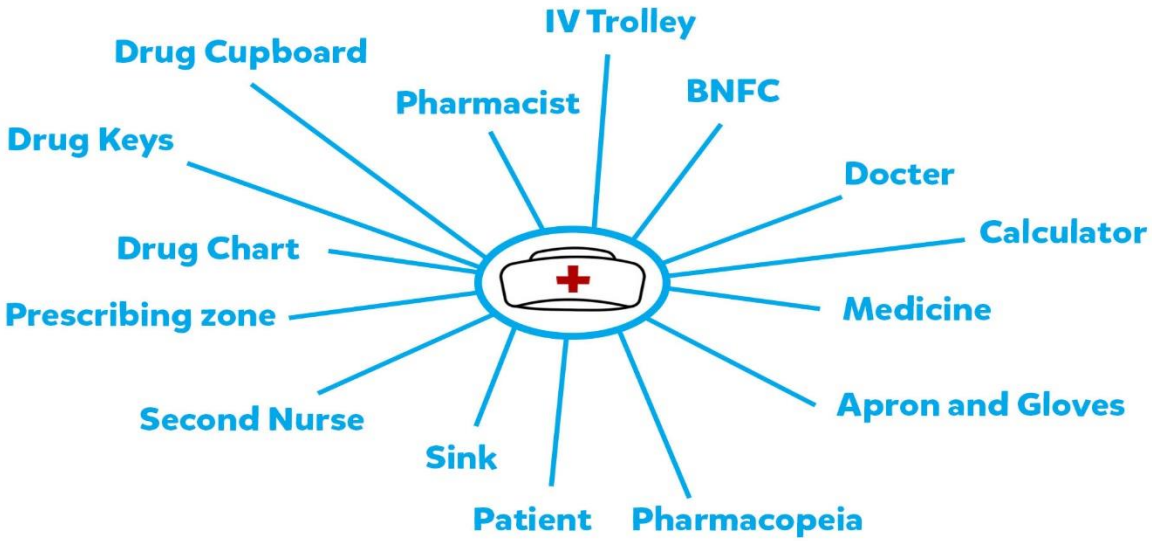
The R&I Department has reviewed the following documents and NHS permission for the above research has been granted on the basis described in the application form, protocol, and supporting documentation. The documents reviewed were:

Documents	Version	Date
Patient information sheet observation/interview	2	25 Nov 2015
Patient information sheet – observation	2	26 Nov 2015
Research protocol	10	07 Dec 2015

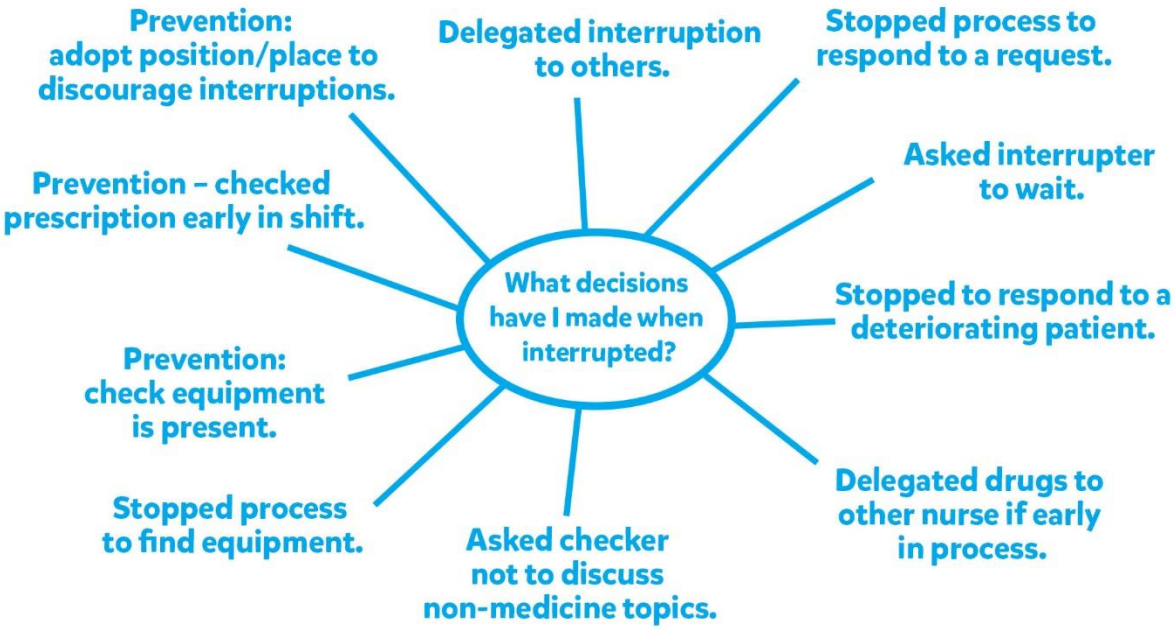
Appendix 12

Mind Maps

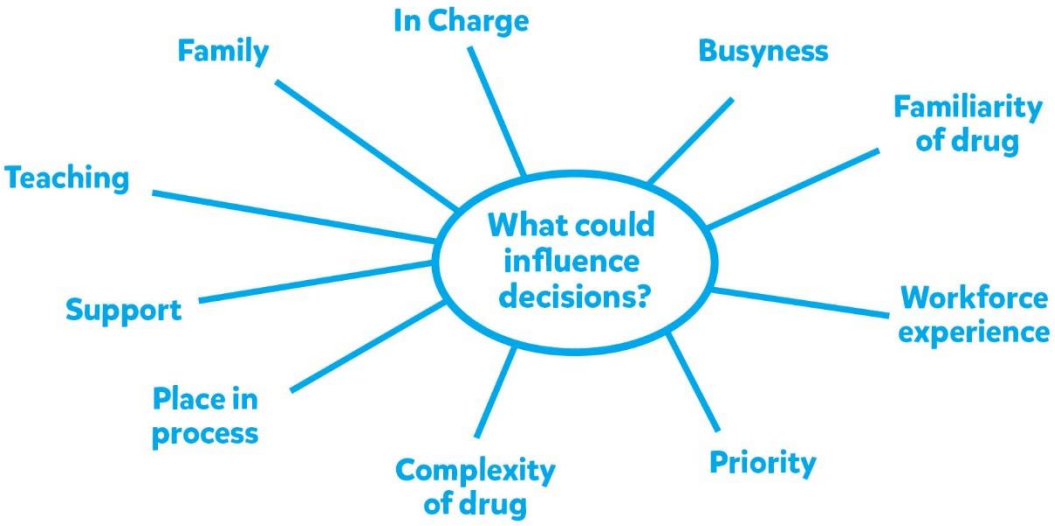
Resources involved in medication administration



Decision making during medication administration



Factors that may influence decision making



Appendix 13

Focus, Concentration and Awareness Matrices

Matrix for Focus, Concentration and Awareness

Actual (events and outcomes that occur in the world)

	Response to Patient Condition	**Fluctuating Levels of Concentration**
Participant 1	And at that point I didn't want to check that medication because I knew I would be called to do something with the patient at that time. And I think that's a safety aspect, I think that if I'd started drawing that up, I wouldn't have finished what I was doing. So I think that was starting it later. Line 101-103	I think you can get people that say things so if you're doing something particularly that doesn't require a great deal of brainpower like you are drawing up saline, the ampoule of saline and you've got the syringe and are drawing it up I think there's a tendency then for people to talk to you I think especially if you are doing something like 50mls of saline or something, you're doing the same thing for a period of time that you don't necessarily need brain wise to think about then I think people do tend to say other things Line 144-148
Observation 1	After drugs removed from cupboard, patient desaturated to 47%. Both nurses required to assist with stabilisation. Line 21-22	Difficulties getting the Tazocin to dissolve, this was discussed by the nurses Line 45
Participant 2		While you are just stood there shaking it about, can I just ask you this? Line 139
Observation 2		
Participant 3	because he's a ventilated patient, I do like to eyeball the observations to make sure although the alarm limits are set on the monitor I do often, I do glance at the monitor to check, to see what the numbers are doing for that split second when I'm drawing up the dextrose. Line 306-309	I like to do that as like one thing before I'll glove up and that because then my mind set's on checking all the drug doses of those drugs Line 69-70
Observation 3	Primary checker glanced over at patient whilst drawing up 5% dextrose Line 66	Whilst drawing up Rocuronium drug primary checker looked over at ward round. Line 81

	Response to Patient Condition	Fluctuating Levels of Concentration
Participant 4	then I turned the patients head and then saw the neck line was leaking so I then had to em tackle that first drawing up anything else, I needed to know I had access so then we dressed the line, and then we went to start drawing up the drugs. Line 73-76	I think it was because it felt that it wasn't, it's not that I didn't feel that it was important but I felt that I couldn't change anything there was nothing that could change by me having a conversation with checker about the patient, em because I was mixing yep, if that makes sense? Line 114-116
Observation 5	Physios had started to treat the patient. Patient desaturated and help was required from the nurse to turn the patient. Once the patient was turned the nurse discovered that the CVL was leaking. CVL was cleaned and redressed. Line 21-23	While mixing the cefuroxime with water for injection both nurses engaged in a personal conversation. Line 29-30
Participant 5	Name 2 was away from her bed space doing things or tied up, name 2 was going to check my drugs with me but then her patient became very wriggly. Her patient was intubated and we didn't want it to self-extubate. Line 55-57	
Observation 5	Drugs remained on trolley with CD book open. Primary checkers patient desaturated to 85%. Primary checker adjusted patients position and suctioned. Line 15-17	
Participant 6	well we were just I just said em we were having a discussion about whether to put a volume in because it was some IV fluid so obviously it was going to be continuous but em I was saying I didn't oh it's a little baby I don't always like not having a volume to be infused in because you think that one bag is a lot of fluid for them if something happened and it all went through. Line 183-186	
Observation 6		

	Response to Patient Condition	Fluctuating Levels of Concentration
Participant 7	he's been a very stable on the ventilator he's not been having, it's not a respiratory based problem, so he's not been having any issues, so I probably wouldn't have been as concerned as if he'd been a bronch anything respiratory Line 71-73	I think when it's drawing up you're focusing, you're looking at, doing maths you're working out doses and so on. when it comes to just pushing its just a case of pushing in to a central line so you're not particularly observing a cannula site as such so I was just doing a bit of a saline flush and keeping an ear out trying not to focus too much. Line 176-179
Observation 7	Primary checker looked at monitor whilst administering drug Line 54	
Participant 8	because I'm monitoring the patient's blood pressure em and I need to be aware of any changes that are happening clinically and because I'd set the parameters when I was doing the safety checks I knew that if it alarmed it's because something was out of the normal range that I was expecting so I needed to check whether it was something that needed any immediate attention. Line 138-141	But if I was directly asked a question or conversation the I probably would pay more attention but at the time I wasn't really aware that they were talking. Line 149-150
Observation 8	Interruption 4 Monitor alarmed for low BP whilst washing hands. Nurse glanced at monitor and carried on washing hands Line 24-26	Discussion about heat in cubicle whilst drawing up IV paracetamol. Primary checker engaged in conversation at same time as drawing up IV paracetamol. Line 32-33
Participant 9	for patient safety reasons em the medications didn't need to be given immediately at that time we just needed to make sure the patient was safe before we carried on so I think I stayed with the medications at the time and nurse A went over to check that the patient was ok so the blood pressure were alarming and I think the sats had started to droop slightly and the patient the previous day had had needed some resuscitation so we just wanted to put those alarms first. Line 219-224	so I wanted to concentrate on what I was doing at that time so I did I didn't ignore it. I didn't ignore it, I did ignore it. Line 214-215

	Response to Patient Condition	Fluctuating Levels of Concentration
Observation 9	Inotrope noticed to be 30mins away from running out. Change of medication plan. Line 29	Monitor alarming in another bed space. No response noted Line 34
Participant 10	yeah it is very distracting cause yeah because the patient was having lots of ectopics which could go into VT we'd been informed, so I was aware of having to watch the monitor and watch what she was doing whilst at the same concentrating on doing the drugs. Line 90-92	I don't think so because at that point I'd done all the checks of the right dose, right route, you know etcetera, actually I just needed to push it slowly so that was all I needed to do, so I could talk while I was doing that and cause actually it helps to make it go a bit longer when you're pushing it cause if you talking at the same time as you are doing it you may be take a bit longer so actually it's more helpful in a sense, whereas if I was programming my pump or something I wouldn't you know it was a simple slow push so I think that was fine to do that. Line 184-189
Observation 10	Checker walked away between drugs to own patient Line 34	Nurse spoke to checker about baby in bed 8. Checker looked at baby but process continued Line 42

Matrix for Focus, Concentration and Awareness

Empirical (human perceptions of what's actually happening?)

	Interruption Awareness	**Ability to dual focus**	**Ability to focus on primary task**
Participant 1	gosh I wouldn't think 11, I kind of think 3 or 4, but I was going to say actually that time, wasn't the most times I've been interrupted, that's quite a, that is quite a general one Line 110-11	although I was drawing up the Tazocin I was looking at the saturations the patient had gone from being 45% saturated, we'd managed to get them on the oscillator, redone the chest drain and then they were now 75 - 80% so then we did the IV's but I was conscious that he didn't deteriorate Line 177-180	actually, do you know I wasn't aware she was singing. She was singing at one point but I wasn't aware that was while I was doing the medicine Line 428-429
Observation 1		Registrar altered ventilation settings as saturations had dropped into 70's. He informed nurse administering Tazocin who continued with process. Line 67-68	Fire bleep alarmed x4. Close attention (tilting head towards bleep to listen) Line 101
Participant 2			
Observation 2		Discussion about patient wash and time planning whilst removing packaging Administration not stopped Line 12-13	
Participant 3		but you wouldn't block out like a shout for help or that sort of block so .. I guess you must be aware of your environment that's around you but you must be able to channel what's important and what's not Line 189-191	……. It's difficult to answer but I guess you block out almost unnecessary like noise Line 188

	Interruption Awareness	Ability to dual focus	Ability to focus on primary task
Observation 3	Interruption 2 Keys pulled out from under drug chart whilst checking doses Checking process continued No sign of acknowledgement given to indicate awareness Line 32-35	Process continued able to talk and draw up volume at same time Line 39	Ignored return of sharps bin Line 16
Participant 4	It was the infusions that I felt were really interrupted mainly myself and checker interrupting us. So yes Line 61-62	so it's always on your mind so I don't feel that you're giving the task in hand 100% because you've always got that niggling at the back of your mind that there's drugs out and they shouldn't be. Line 86-88	no I was still very concentrating, very much concentrating on the rate I was pushing at, watching the clock Line 135-136
Observation 4	A consultant arrived at the desk at the end of the bed and said hello to both nurses, whilst drawing up. Both nurses looked at the consultant Line 74-75	Mixing of drug continued. Primary checker was looking at vial but answering questions and having a conversation with checker Line 31-32	Appeared to focus on completing observations Line 19
Participant 5	well it was very distracting because I had intended to start about 15 minutes before I actually started Line 51-52	(whilst drawing up drugs watching) that the saturations were above 90 and that the ventilator that was alarming wasn't in apnoea ventilation mode. Line 122-123	it was less of a distraction because I was actually trying to concentrate. Line 133
Observation 5	Whilst drawing up IV antibiotic receptionist stood at side of trolley. Process continued and no response to receptionist noticed Line 34-35	Whilst drawing up medication primary checker looked over at patient in next bed. Line 31	Administration was stopped. Primary checker was focused on other patients' drugs Line14

	Interruption Awareness	Ability to dual focus	Ability to focus on primary task
Participant 6	emm yeah I did hear that, I just looked at it and thought it's not my pump hopefully someone else will sort it out I'm just doing this Line 162-163	seeing why its alarming and whether it's something you need to go and stop doing the drugs and go and sort your patient out, or whether you can just almost ignore it and carry on doing your drugs Line 131-133	So I wouldn't have said it was oh its really noisy I can't concentrate I think I zoned out. Line 159
Observation 6	Just as about to start checking medication receptionist came and asked for another nurse. Second checker responded by telling her where the nurse was. Line 17-18	Ventilator alarmed. During break between drawing up and administration primary checker looked at ventilator Line 78-79	Pump alarmed in another bed space while getting IV giving set out of draw. Process continued and no response observed. Line 66-67
Participant 7	em once as I was starting to draw up but yeah a nurse who was purposefully trying to distract me I don't think she realised you were there. Em but that was the main distraction Line 47-48	I could hear they were having a conversation but I wasn't paying any attention to particularly what they were saying. Line 153-154	If I'm focussed on one task I don't tend to pay a major amount of attention to other things unless it's something like a particular, like if I'd heard the saturation monitor going off Line 158-160
Observation 7	Ventilator alarmed. No response to alarm noted Line 15	Primary checker was administering bolus drug to patient. Did not join in conversation but was looking at CNS and student, appeared to be listening. Line 48-49	CNS could be seen at door. No response from nurse's process carried on Line 27-29

	Interruption Awareness	Ability to dual focus	Ability to focus on primary task
Participant 8	once I had someone there to check things em there wasn't as many things to interrupt as if I was out on the main bay and there's a lot more people around asking you questions and things Line 52-55	so because I know the different sounds that the ventilator makes I can hear the alarm and know if it's like an important one or a more minor one and because there was someone there watching and I could hear that it wasn't a major alarm I didn't feel at that point that I needed to look line 360-363	There wasn't a lot going on so it was easier to filter out things. Line 413-414
Observation 8	Ventilator alarmed whilst checking dose of IV paracetamol Process stopped and silenced alarm by primary nurse, checker not present Line 14-15	Discussion about heat in cubicle whilst drawing up IV paracetamol. Primary checker engaged in conversation at same time as drawing up IV paracetamol. Line 32-33	Yellow ventilator alarm sounded twice. No response seen from nurse Line 99
Participant 9	I think you are aware of monitors alarming around you, em so you do tend to glance over as you're drawing up medications so it can be a distraction Line 119-120	I think I was probably focused on the other tasks cause I obviously knew the drugs were out but there Line 72-73	I think you kind of just have to block it out and I think as long as it's clear and both the two nurses check the pump as long as you can hear each other and you're going through the process you kind of do have to block that sound out in the background. Line 157-159
Observation 9	Packet dropped off trolley, primary checker made a comment. Line 37	Parents said goodbye. Primary nurse moved to the side to let them past. Continued to administer drug but had a brief conversation. Line 84-85	Monitor alarming in another bed space. No response noted Line 35

	Interruption Awareness	Ability to dual focus	Ability to focus on primary task
Participant 10	it is very distracting cause yeah because the patient was having lots of ectopics which could go into VT Line 90-91	so I was aware of having to watch the monitor and watch what she was doing whilst at the same concentrating on doing the drugs line 91-92	no I don't think so because yeah cause at that point I wasn't thinking about the actual dosage or anything I was just going to wash my hands. Line 82-83
Observation 10	Another nurse had taken IV guide. Primary checker left trolley to retrieve IV Guide Line 73	Whilst administering bolus drug to patient BP increased to 112/64 mean 86. Glanced at screen and carried on with bolus. Line 84-85	All through programming monitor alarmed for decreased HR, BP and sats Line 57-58

Matrix for Focus, Concentration and Awareness

Real (structures and systems which appear underneath appearances)

	Desensitisation to Interruptions	**Conversational Influence**
Participant 1	gosh I wouldn't think 11, I kind of think 3 or 4, but I was going to say actually that time, wasn't the most times I've been interrupted, that's quite a, that is quite a general one. I think that's an uninterrupted one Line 110-112	I think that when there's only one or two doctors on a weekend and the patient was as poorly as they were emm saying that, I can't remember what he asked me which makes me question whether what he asked me was actually relevant at the time that he needed to know that information straight away Line 125-128
Observation 1		Whilst having this conversation, discussing patient condition whilst on oscillator and watching the reg performing an ultrasound. Preparation continued. Line 49-50
Participant 2		if you then, start being distracted, start talking about, I don't know, wanting a break, whatever, or this that and the other, emm I think that's when parents think oh she can talk to her about things but I can't ask her questions about my child Line 134-137
Observation 2		Primary checker talking to self through out Line 9
Participant 3	I wasn't interrupted enough to be aware …… that I needed to ignore that interruption to be able to concentrate to carry on if that makes sense? Line 92-93	so I was aware that I was in the process of programming the pump and she'd asked me a question, however, I knew I was nearly at the very end of administrating the drug so for the sake of 10 seconds I would be finished and I would be able to address what she was saying Line 129-131
Observation 3		Discussed that they were happy to run potassium with fruseomide Line 20

	Desensitisation to Interruptions	Conversational Influence
Participant 4	I have previously been interrupted for the same things, for the keys, for someone wanting to get in your IV trolley or conversations between our selves. It felt quite standard. Line 65-67	but then checker was talking about swapping needles and things like that so I think it threw me off a little bit cause I always swap the needle anyway and then we debated whether you draw too much up and then fill your needle or whatever he was suggesting em so I think that did throw me a little bit actually em I think I managed to get my concentration back Line 244-248
Observation 4		Whilst drawing up saline flushes discussion held about other drugs due. Line 34
Participant 5		And the consultant that we had is very chatty and ward round takes a bit longer because she chats, Line 66-68
Observation 5		Discussion held between nurses about what size of syringe to use. Line 37
Participant 6		I don't think so cause I don't think we were actually started drawing them up I think we were about to start to so it was easy enough to say where ever she was. Line 65-66
Observation 6		Other nurse commented 'XXXXXX you might know' then 'oops she's doing drugs' Line 45
Participant 7	I think it was fairly, it seemed like quite a straightforward process then there was no I didn't get called or anything whilst I was actually doing them. Line 57-58	I think the nurse I was checking with made a comment that it was hot in the cubicle. I agreed because it is very hot in the cubicle. But I think that was, it wasn't a full conversation just a couple of comments. Line 137-139
Observation 7		Conversation about heat in cubicle initiated by checker Line 31

	Desensitisation to Interruptions	Conversational Influence
Participant 8	but yeah there were a few cases where the surgeons came in and I needed to update them and the dad came in and needed help putting his apron on and em there kind of yeah there just things that happen throughout. Line 55-58	yeah so I think the discussion about the heat was partly because it was affecting our concentration on doing the task em because the room was so hot and we hadn't had a drink for ages em so we were kind of talking about it to see if there was something we could do to change that. Line 155-157
Observation 8		Discussion about heat in cubicle whilst drawing up IV paracetamol. Line 32
Participant 9	I think the first the first observation was probably, probably normal really I think the second was slightly more em but yeah you do get interrupted several times when you are making up medicines. Line 63-65	yeah to be honest I think there was a distraction there, because somebody is engaging you in a conversation, you almost have to acknowledge them em so you are not coming across rude but you don't want to take your mind away from the fact you are drawing up medications Line 134-136
Observation 9		Comment about taking a long time to dissolve Line 63
Participant 10	So when I went to draw it all up I realised it was the wrong one, so I had to go and find the keys and get the drug and so forth but that at that point I didn't have I don't think I had my gloves on and wasn't ready to go so it didn't distract too much but it was just a bit of an inconvenience. I had to go and find it. Line 242-245	so I was explaining I guess to the person checking that's why I was taking a while getting the right amount cause I needed to get the froth out. So I could reach the correct dose. Yeah that was all really. Line 134-136
Observation 10		Primary checker said 'hello, are you alright, just doing her meds' Line 22